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Action Scheduled for November

THAT the shipping bill will come up for action in the House in November and in the Senate in December is the belief of the majority of the Congressmen. The opponents of the subsidy know full well that to delay action on this measure in the House until the short session, when that body's time will be fully occupied with appropriation bills, would delay consideration of the proposed shipping legislation until the next Congress which begins in March. In the meantime they hope that the elections in November will result in a depletion of the Administration's majority and that a sufficient number of new members who are opposed to Government aid to shipping will be obtained to kill the bill for good and all.

It is not reasonable to suppose, however, that the Administration after causing one of the most complete studies that has ever been attempted on any subject made by the very best experts on shipping, and after incorporating the facts and findings of these experts in the pending legislation and putting up the splendid fight for an American merchant marine that it has, will sit quietly by and allow the opponents of the bill to have their way without a struggle.

It is, therefore, with a great deal of satisfaction that we note a quotation of Representative Mondell, Republican floor leader in the House, in a bulletin of the National Merchant Marine Association which is as follows: "The shipping bill is not dead by any means. We will follow the President's suggestion and postpone action on it just for the present. I believe that it will be taken up in November and may even be passed before the December short session."

The subsidy opponents will also shortly find out that the American merchant marine has a good many staunch supporters among the Democrats. Note the way the National Merchant Marine Association, of which Senator Joseph E. Ransdell, a Democrat, is president, figure it out. "The President has agreed to a postponement until shortly after election, presumably until Monday, November 13, and the few weeks remaining between then and the opening of the December session will supply sufficient additional time for the shipping bill to make its passage practically assured. Under the House rules speedy action can easily be secured and the bill passed before the beginning of the December session, while the Senate will have probably about six weeks in which to act before the annual appropriation bills will have come through the House to the upper branch."

Bearing in mind the extraordinarily difficult industrial situation to which the President has been compelled to devote practically his whole time during the summer, it is a reasonable belief that he suggested the postponement of action to November in order that he might be free to champion to the limit the cause of American shipping. When the time for action arrives and the complex problems now confronting the Administration and the supporters of the subsidy bill are solved, then, the foreign shipping interests and their followers will learn that America is determined to support its merchant marine by the only comprehensive plan that has been advanced by our shipping experts.

American Marine Week

AMERICAN Marine Week, which will be celebrated at the Grand Central Palace, New York City, from November 4 to 11, will have a far reaching effect on the destiny of our merchant marine. The benefits that can be secured for American shipping through the cooperative and united action of the principal maritime organizations cannot be exaggerated. With the marine field acting as a unit, it is bound to have a strong influence on the passage of the pending shipping legislation and, with the widespread publicity that undoubtedly will be given to the papers and addresses, presented by prominent men at the various meetings, there cannot fail to be a revival of interest in our merchant marine in the public mind. When the

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general public realizes that the prosperity of our country depends on shipping our surplus products to foreign markets the future of American vessels will be assured.

American Marine Week means much to the marine field in general but it will mean much more to every man who is fortunate enough to be able to attend. The Marine Exposition will be a brilliant display of everything that is new and interesting to the marine profession. Models of ships and inventions, full size specimens of equipment, fittings and the products that enter into the construction of vessels, naval exhibits, life saving devices and many other items may be examined and studied at close range. No one who desires to keep up to date can afford to miss such an opportunity.

In addition to this, professional men will have an opportunity to hear technical papers that will be read before the annual convention of the Society of Naval Architects and Marine Engineers. These papers and the discussion of them by members of the society are published all over the world. What an opportunity not only to hear the best that America can give to the science of naval architecture and marine engineering but also to see and make the acquaintance of the leading specialists in marine design!

But even this is not all, for at the convention of the American Marine Association addresses on maritime subjects will be delivered by prominent Government officials and leading members of the numerous organizations participating in American Marine Week. So it will be the privilege of those who attend the conventions to get a composite picture of the problems of the entire marine field and its allied industries.

Finally, one of the greatest reasons why every one who can possibly attend should do so is that the entire week offers opportunities for making acquaintances and meeting old friends. There is no other occasion during the whole year when the entire marine field gets together. The intimate business and social intercourse between shipowners, shipbuilders and manufacturers of marine equipment from all over the country is not only of great benefit to the industry as a whole but it is also of great personal advantage to every one who has the privilege of attending.

The Agamemnon and Mount Vernon

ACCORDING to a newspaper interview with Commissioner Frederick I. Thompson of the Shipping Board on his recent arrival from Europe, that official will immediately recommend that the liners *Agamemnon* and *Mt. Vernon* be reconditioned and put into service. As an indication of the necessity of putting these ships in commission, Mr. Thompson reported that the *George Washington* could have taken 200 additional passengers on her return trip, if there had been room for them.

Officials of the United States Lines have made careful studies of the possibilities of these vessels and their estimates show that very favorable returns could be earned on the cost of their repair. The *George Washington* and *America* are making money and there is a growing sentiment both here and abroad in favor of traveling on the ships of the United States Lines. The *Leviathan* will be a great advertisement for our merchant marine and practically all Americans who travel to Europe will want to say that they made at least one trip on this famous vessel which, when completed, will be second to no ship afloat.

On the other hand what is to be done with the *Agamemnon* and *Mt. Vernon*, if they are not reconditioned? Are they to be allowed to rust away at their docks at Hoboken and Boston or are they to be sold to foreign interests who will recondition them and put them into competition with our own vessels? Is the *Leviathan* to be the only 23-knot liner in the American transatlantic service until new ships are built? Who is going to be responsible, if that vessel builds up a sort of one way express passenger service from which foreign lines receive from one-half to two-thirds of the benefit?

A Standard Bill of Lading

IT is generally recognized that there is an urgent necessity for a clear codification of the rights and liabilities which arise between carriers and shippers upon bills of lading used for ocean shipments. The Hague Rules, 1921, which are the result of voluntary action and bargaining between vessel owners and shippers, were drawn up under the guidance of the International Law Association and they contain, in such terms that business men all over the world who are engaged in overseas trade can understand them, a set of rules that has received the endorsement of most foreign commercial organizations and the Chamber of Commerce of the United States.

To quote Mr. A. D. Mearns, chairman of the Liverpool Steamship Owners' Association: "I am satisfied that the drafting as it stands will serve in the 999 transactions of which the lawyers never hear. I should have thought that it would serve even in the one case out of the 1,000 that comes before the law courts, if the lawyers are only content to interpret the rules as they are understood by the traders and the shipowners, and to forget the thousands of cases that have been collected, discussed and criticised by Lord Justice Scrutton and Mr. Carver."

We are, therefore, glad to learn that the United States will send representatives to take part in a discussion of a revised form of the Hague Rules which will be under consideration by the Comite Maritime in London on October 9-11. The results of this consideration by the Comite Maritime will be brought before the International Maritime Conference which is to meet in Brussels the latter part of October. This conference has been called by the King of Belgium and the United States will be represented there by official delegates appointed by the President.

In order that the delegates from the United States might have the benefit of the views of all interested parties, the Shipping Board held public hearings in Washington on September 20-21 which were attended by representatives of shipowners, shippers and underwriters. The Shipping Board is to be commended on securing American representation at the coming International Conference and also for giving our delegates a line on the opinions of our business men through a public hearing. It will be noted from the article on page 643 that there is not an American signature on the recent report of the International Conference on Safety of Life at Sea.

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The 1,000-Foot Ships

CHAIRMAN LASKER'S statement, that a $30,000,000 company has been projected which will construct two mammoth liners of 1,000 feet length and of 70,000 gross tons, providing the pending shipping legislation is passed, has caused considerable comment. Although Mr. Lasker asserted that the names of the members of this proposed company are household words, no publication, at this writing, has succeeded in obtaining anything but denials of participation from the prominent men who would be considered most likely to engage in a shipping venture. But, as it is inconceivable that Mr. Lasker would make such a statement without good reason to believe that these vessels would be actually built providing reasonable national protection is secured for our shipping, we can account for our lack of knowledge of who the principals really are by the fact that financial affairs are usually consummated before they are made public.

There is nothing new about a proposal to build vessels of 1,000 feet in length. It will be remembered that there was considerable publicity given to such a project about three years ago and at least the preliminary plans for two 1,000-foot liners were said to have been actually made by the Gibbs Brothers. Perhaps, if President Wilson had not requested the International Mercantile Marine Company not to dispose of its vessels flying the British flag to an English syndicate, these ships would have been under construction or completed today. Optimism prevailed in shipping circles in 1919. Prominent shipowners predicted that the shipyards would be busy for years and it was easier to obtain $200 a ton for a vessel then than it is to get $30 now.

Since then, however, the White Star Line and the Cunard Line have each placed three monster greyhounds on the North Atlantic service and these big ships are not only paying their own way but also making up any deficits of the smaller vessels. It is a fact that accommodations on the larger vessels are always in demand in spite of the excess fare and when a vessel is carrying between 1,000 and 1,200 first and second class passengers each way it is not difficult to believe even if we did not know that they are clearing as much as a quarter of a million dollars on each round trip.

Now as the great majority of first and second class passengers are American citizens, there is every reason to believe that American ships having equal or greater speed and luxurious appointments would secure their share of the trade and, if the Government, as it is proposed in the shipping bill, grants sufficient compensation to make up the difference in cost of construction and operation over that of foreign ships, what is there strange about America adopting the German policy of going their English rivals one better?

The shipping bill is framed to encourage the construction of vessels that are most needed not only from a commercial but also from a naval standpoint. The 1,000-foot ships would be a most important addition to our naval reserve and, for this reason alone, they ought and probably would be entitled to a maximum loan at 2 percent interest from the Construction Loan Fund, if their plans were approved. The subsidy for such vessels on account of speed and tonnage would exceed that for any other class of ships.

Suppose to all these considerations were added the net work of soliciting agencies and ticket offices of the Pennsylvania Railroad. Suppose that railroad should sail such vessels from Montauk Point, running boat trains from New York over its subsidiary the Long Island Railroad and in so doing reduce the time of transatlantic passage by 7 hours. The Canadian Pacific is making a success of its passenger steamship lines on both the Atlantic and Pacific. If they can do this in Canada, why not in the United States?

Motorship Makes Remarkable Record

ACCORDING to a letter sent to Admiral Benson from Captain R. H. Wright, master of the motorship *William Penn*, a carefully made record of all mileage covered, including sea voyages, rivers, canals and harbor movements, shows that this motorship traveled a total distance of 44,781 nautical miles in the year starting August 7, 1921, and ending August 7, 1922.

Captain Wright also stated that "during the whole of this period she has never made an involuntary stop, she has suffered no breakdown of any sort and her repair bill for actual repairs of all sorts is less than $100, United States currency.

"Her average speed for the period hereinbefore stated was 11.16 knots; her approximate fuel consumption has been 13 tons per diem, while her average consumption per diem in port has approximated 64 gallons."

The *William Penn* was originally designed for a steam installation but before completion it was decided to fit her with Burmeister and Wain type Diesel engines which was done at the yard of the William Cramp and Sons' Ship and Engine Building Company. She is a twin screw vessel of 17,000 tons displacement, having a deadweight carrying capacity of 12,375 tons and her engines are rated at 4,250 horsepower.

Her record for the year stated above is worthy of note for the number of nautical miles covered, the absence of a breakdown of any nature, the small cost of voyage repairs and the fuel consumption. Allowing due credit to her officers and particularly to Chief Engineer Olsen who showed the writer one of the cleanest and most shipshape looking engine rooms that he has ever seen when the *William Penn* was in New York harbor after her first voyage around the world, the performance of this vessel should have a decided influence on future machinery installations.

More than this, it should be a real inducement to shipowners to purchase a number of the tied-up Shipping Board vessels which can be obtained at very low figures and convert them to motorships. When a vessel's machinery runs a whole year without an involuntary stop, there can be no question of reliability; when the voyage repairs for that period are less than $100, the quality of the machinery cannot be excelled, but when you can operate a ship of that size on 13 tons of fuel per diem, when it would require at least 50 tons with a steam installation, then it is either time for shipowners to start acquiring motorships or for Diesel engine manufacturers to reduce the price of production to a point where the first cost figures do not require too long a time to make up the difference in cost of operation.

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Ship Subsidy Is a Retaining Fee for National Defense

The "Merchant Marine Fund," Provided in the Shipping Bill, Should Be Called the "National Defense Retaining Fund"

By "Old Scotch"

IN the matter of national defense on the seas, many Americans, since the Washington Conference on Disarmament, have lulled themselves into a spirit of tranquility because by virtue of the 5-5-3 treaty with Great Britain and Japan we are on an equality with the world's greatest naval power. But is such the fact? Who among all of the people in the country fails to remember the terrific havoc wrought to the allied shipping by such raiders as the *Moewe* and *Eitel Frederick* and half a dozen more like them. Yet the German surface navy was supposed to be hermetically bottled up back of the guns of Heligoland and other impregnably fortified places. This little retrospection is simply to recall that merchant vessels are a very important means for sea strife, not to mention their value for carrying supplies, fuel and men to keep fighting vessels at sea, and to carry on military operations on foreign shores. Hence without a merchant marine, our 5-5-3 tranquility is somewhat of a myth.

Counting all merchant ships of 13 knots and upwards as available and necessary adjuncts to the regular fighting vessels we find the following comparisons between Great Britain and the United States:

Vessels Over 3,000 Tons	Great Britain	United States
13 to 18 knots speed.....	548	144
Over 18 knots speed.....	44	6

The above figures represent relative sizes of the two merchant marines for purposes of national defense as they were on January 1, 1922. If conditions continue as they are today, even our inferior proportion of the vessels quoted cannot be maintained, as many of our ships are idle and will rapidly depreciate in both physical and financial value. Suffice it to say that our tranquility regarding the 5-5 ratio is very evidently a myth, and that unless efforts are made by the Government to maintain the merchant fleet we now have, and to add a sufficient number of diversified types of craft to round out a sufficient and reliable supporting fleet of merchant vessels, our feeling of national security on the seas may at any time suffer a decided shock and rude awakening.

Enactment of Subsidy Bill Absolutely Necessary

The pending merchant marine bill, if enacted, is absolutely necessary to save us from such a shock, and attention is drawn to our palpable unpreparedness for national defense, so far as the necessary fleet of merchant ships is concerned, to emphasize the suggestion herein made, that this phase of the pending bill is of equal importance to the needs of maintaining a merchant fleet for our commercial interest.

The so-called "Subsidy Bill," has now been before the public for nearly a year, and such opposition as has been raised in the public press, has almost entirely been centered on the direct payment of money to shipowners, to enable them to overcome the handicap of higher initial costs and higher maintenance charges, when compared with similar merchant vessels operated by our foreign rivals.

People familiar with shipping, and with the terms of the pending bill, know that the object of this direct compensation is "To promote the growth of the foreign commerce of the United States," and "To contribute to the national defense," but to the average reader who gains his limited knowledge of maritime affairs from headlines in the daily press, the impression prevails that the entire object of the bill is to aid the owners of merchant ships to carry on their own business on the seas. The money to be raised for this purpose is called in the bill the "Merchant Marine Fund," which still further convinces the average citizen that his superficial estimate is correct.

Direct Subsidies Are for National Defense

As the maintenance of a merchant fleet in private hands is so distinctly a great national asset for purposes of the common defense on the seas, this direct payment to private shipowners should be made with the distinct understanding that it is a "Retaining Fee" from the Government to the private shipowner for having the first claim on his ships for purposes of national defense. The money with which it is paid should be taken from the "National Defense Retaining Fund," and it should be termed such in the pending bill. This should be stressed in all debates by the friends of the measure, and in all references in the public press, in order that the public may get away from the idea that shipowners are alone to benefit from the proposed legislation.

The idea of a "retaining fee" is now well established in our daily life, and it is not considered in the nature of a gift by any means. The first claim on services in emergencies which may arise is a "quid pro quo" generally recognized.

What the "National Defense Retaining Fund" Will Do

It is an indisputable fact that we must maintain a large merchant marine as a complement to naval preparedness in the defense of our country. With that as a basis, if we do not maintain such a fleet by means of the pending shipping bill, the only alternative is that the Government must build and maintain such a fleet of vessels as a part of its naval fleet. On the basis of the Retaining Fund idea, with ships in private ownership, this can be accomplished for $30,000,000 per annum; in the event of the necessary merchant fleet being maintained under naval auspices and solely for defense purposes, the total expense would be enormous, and possibly would cost as much as the fighting ships of the regular navy as now maintained.

Without some such encouragement as now contemplated in the shipping bill, it needs no seer to predict that in a very short time our merchant marine would rapidly degenerate to its pre-war condition, where the number of efficient ships engaged in foreign trade could be counted on the fingers of both hands. Modern wars with our up-to-date systems of communication and transportation come very suddenly. No one expects or wants to see any more warfare in this generation, but the unexpected is what usually happens. A merchant fleet for use in the national defense cannot be improvised, built nor bought in an emergency. Our sins of omission in the matter of having merchant ships cost us more than three billions of dollars in the World War. In the light of so recent a catastrophe, are we again going to be caught in such a trap?

Of course there is bound to be captious criticism of the idea of paying retaining fees to shipowners for the first use

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of ships in the time of national emergency. The arguments will be advanced that any one possessing equipment necessary or useful for war purposes should be the recipients of retaining fees for possible emergency use by the Government. The owners of large numbers of motor trucks, for example, might claim that as such vehicles are highly essential in the prosecution of a war, they should be recompensed for holding them in readiness and fit for use in times of strife. The answer to such claims is simple, as ships are in a class by themelves, in that they can be owned by American companies, and for purposes of economical operation may be sailed under alien flags.

It might be claimed that we can pass a law forbidding the transfer of flag on any ship now documented in this country. Very true, but how long would such procedure insure the operation of an efficient merchant fleet for naval purposes. All replacements of existing ships could be placed under foreign flags, and in a very brief time we would find American flag ships had disappeared from the seas; then where would we get the ships necessary for national defense?

The great fleet of merchant ships on the Lakes is not only unsuitable for ocean service, but unobtainable on account of canal restrictions. Our coastwise fleet is insufficient in number, type and size for the needs of the country in war times. It is a very recent date that a large exporting concern in this country found it cheaper to charter foreign vessels to transport its goods to Far Eastern ports than to use its own vessels under the American flag. Consequently they were tied up at the wharves. This would probably occur again, unless Congress provides some such relief as is contemplated by existing bills in Congress.

PROSPECTS FOR SHIPPING LEGISLATION GROW BRIGHTER

Fortunately for everyone concerned the prospects for legislative relief are now more roseate than they were. President Harding and our Congressional leaders are determined to force action, even to the extent of calling on extra session shortly after the Fall elections. Rail and coal strikes have for a time taken the public attention away from what has been termed the most important question now before the American people.

The bonus for soldiers, and the tariff for protection of our industries, are very important for the time being, but they pale into insignificance when compared with the dire necessity for providing a lasting system for maintaining our merchant shipping, both for our commercial needs and for the defense of our country. The latter must not be subordinated in the popular mind, and it behooves Congress and the public as well to consider the expenditures proposed of equal importance for both of the benefits to be derived—commercial independence on the seas and adequate national protection.

American Marine Week Comes at Psychological Time

Cooperative Efforts of Eighteen Maritime Associations Will Exert Powerful Influence on Pending Shipping Legislation

Naval Architects to Hold Convention in Auditorium of Grand Central Palace
Reduced Rail Fares for Exposition Delegates Secured

THE Marine Exposition and the conventions and meetings of the maritime associations which will be held at the Grand Central Palace, New York City, November 4-11, coming as they do just before the shipping bill is taken up in Congress, are bound to have a very favorable effect on securing reasonable National protection for our shipping.

Whether taking it from the standpoint of designing, building or operating, the American maritime industry is now fighting with its back against the wall. But even as we were not too late in entering the World War so it is now not too late for Congress to grant protection to an industry that is becoming more and more of vital importance to the prosperity and safety of the country.

Therefore, no one who can possibly get away from his work should fail to attend and support this united endeavor of the marine industry. The personal benefit of inspecting the latest marine equipment and renewing and making new acquaintances will be great but the value of a record breaking attendance at this big gathering will, to the industry as a whole, be of greater value.

NAVAL ARCHITECTS' MEETING

The Thirtieth Annual Convention of the Society of Naval Architects and Marine Engineers will be held in the Auditorium of the Grand Central Palace, Lexington Avenue and 46th Street, Wednesday and Thursday, November 8 and 9, 1922. Professional sessions will begin at 10 A. M. each day.

In order to extend acquaintanceships, a reception committee will be appointed. New members or members who have not attended previous meetings should get in touch with the reception committee on arrival at the meeting.

Arrangements have been made to register all members upon entrance at the Grand Central Palace. The data will be on hand at all times at the announcement desk and will be of great service to any of the members who desire to keep in touch with each other during the convention period.

Prior to the general meeting, the Council of the Society will meet at 3 P. M. Tuesday, November 7, in room 1101 of the Engineering Societies Building, 29 West 39th Street, New York, N. Y.

PROGRAM OF PROFESSIONAL SESSIONS

Below is given a list of papers to be read. Members may obtain advance copies of the papers by applying to the Society headquarters, 29 West 39th St., New York, N. Y. In presenting papers, each author will be limited to twenty minutes for the reading of an abstract of the paper; this time to include the showing of lantern slides, if any are to be used. Remarks in discussion of papers will be limited to ten minutes for delivery, including the showing of lantern slides.

WEDNESDAY, NOVEMBER 8

"Automatic Steering." By Elmer A. Sperry.

"Details of Naval Design from Jutland." By Commander Herbert S. Howard, C.C., U.S.N.

"The Application of Dyson's Method to Propellers of Ocean-Going Merchant Vessels." By Edwin A. Stevens, Jr.

"Stresses on Vessels of The Great Lakes Due to Waves of Varying Lengths and Heights." By Professor H. C. Sadler and Professor Anders Lindb'ad.

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"A Study of the Wake of Certain Models by Means of a Current Meter." By Professor Edward M. Bragg.

"Some Experiments on Propeller Position and Propulsive Efficiency." By Rear Admiral D. W. Taylor, CC., U.S.N.

THURSDAY, NOVEMBER 9

"Efficiency in the Operation of Steamships." By Captain Daniel A. J. Sullivan.

"A Sixteen Hundred and Fifty Horsepower Gasoline Fire Boat." By Arthur D. Stevens.

"The Longitudinal Strength of Rigid Airships." By Professor William Hovgaard.

"Machinery and Trials of the Passenger Ships—American Legion Class." By Robert Warriner.

"Standardization as Affecting the Shipbuilding Industry in the United States." By Ernest H. Rigg.

"The Selection of the Best Kind of Propelling Machinery." By James L. Ackerson.

NAVAL ARCHITECTS AND MARINE ENGINEERS' BANQUET

The annual banquet will be held in the Grand Ball Room of the Waldorf-Astoria, 34th Street and Fifth Avenue, New York, on Thursday evening, November 9, at 7.30 P. M. Immediately preceding the banquet there will be a reception beginning at 7.00 P. M. All members and their guests are cordially invited.

Seats for the banquet will be $6.00 each. Each application for tables or seats should be accompanied by remittance and made by letter so as to reach the secretary on or before November 2. Telephone requests must be confirmed by letter.

Members submitting applications for reserved tables should state the number in their party who are not members of the Society. Applications for reservations for more than three tables (30 seats) will, by direction of the executive committee, require special approval, which approval can only be given in the discretion of the committee, after the reasonable requirements of other members of the Society have been met.

REDUCED RAIL FARES

Another announcement of interest and importance is the statement that the Trunk Lines Association has granted a reduced fare rate for all delegates attending any of the meetings in conjunction with the American Marine Association and Marine Week. Persons coming to New York will purchase full priced tickets at their point of departure and will request an identification convention certificate. Upon arrival at the Exposition, the certificates will be validated by the chairman of the Transportation Committee, John A. Hense. Upon returning, holders of the certificates may present them at any ticket window and receive a ticket at half fare, or a saving of 25 percent.

The transportation committee has also arranged adequate facilities in the way of a ticket office, reservation bureau, etc., at the show, and will also maintain a New York City sightseeing bureau where visiting delegates and strangers in the city may arrange for tours.

LIST OF OTHER ATTRACTIONS

A partial list of other attractions, maritime organizations that have so far signified their intention of taking part in the Exposition, and the manner in which they will participate, is given in a report of the Liaison Committee of the American Marine Association, as follows:

1. The Shipping Board—by an exhibit. Plans are under way to secure addresses from Chairman Lasker and other commissioners on the shipping bill or other projects on which the board is working.

2. The Navy Department—by an exhibit and also by addresses of leading naval officials.

3. The Department of Commerce—will stage a combined exhibit of their various marine bureaus which will occupy about 2,000 square feet of floor space. The heads of several bureaus of the Department of Commerce have promised to deliver addresses during the week.

4. The Society of Naval Architects and Marine Engineers—will hold its annual convention *November* 8 *and* 9 in the auditorium of the Grand Central Palace, and its annual banquet on the evening of *November* 9 at the Waldorf Astoria.

5. The Maritime Association of the Port of New York—by an exhibit. They have also appointed Fred B. Dalzell, Jr., chairman of a committee to co-operate in every possible way with the maritime organizations taking part in American Marine Week. Mr. Dalzell has guaranteed that speakers from this organization will be available.

6. The American Steamship Owners' Association—will hold its quarterly meeting on Monday, November 6. Mr. Marvin, vice-president of the organization, assures us that speakers will be available and he is endeavoring to secure attendance at the Exposition of their official technical committee and the members of their organization.

7. New York Tow Boat Exchange—This organization will take part through an official committee and will also furnish a moving picture film of tow boating in New York Harbor.

8. Ocean Officers' Conference (composed of captains, mates, engineers and radio telegraphers)—This organization has agreed to hold a smoker in the auditorium of the Grand Central Palace.

9. Atlantic Coast Shipbuilders' Association—J. L. Ackerson, president, states that the organization will be represented at least by an official committee and that he will try to give us still greater co-operation. Plans are under way to secure speakers from this organization during the week.

10. American Bureau of Shipping—will hold meetings of the board of managers and will hold meetings of their technical committees on both naval architecture and marine engineering.

11. National Merchant Marine Association—We have received letters from this organization stating that they would be glad to co-operate with us and have asked for suggestions as to the best way to do this.

12. American Society of Marine Designers—will be represented by a booth at the exposition and will also be represented by the executive committee of the national organization. This society will not hold a convention this year.

13. The Neptune Association—Captain Milliken, secretary-treasurer, has promised us that he will support American Marine week in any way he can.

14. The Port of New York Authority—will exhibit at the Exposition and co-operate in American Marine Week.

15. Mississippi Valley Association—Plans for this association are under way.

16. Los Angeles Chamber of Commerce—has the matter of exhibiting under consideration.

17. San Francisco Chamber of Commerce—D. K. Grady, Director of Foreign and Domestic Trade Department, is now working on the best way for the San Francisco Chamber of Commerce to cooperate.

18. The American Society of Naval Engineers will have a booth at the Marine Exposition. They will have at their booth bound volumes of their transactions and other interesting material.

The interest in American Marine Week that has been shown by the above organizations proves that the idea of one annual get-together week at the same time and in conjunction with the Marine Exposition has taken firm root. It is particularly fortunate that such extensive cooperation has been extended this year because it will not only assure a splendid and profitable time to all who attend but it will also exert a great influence upon the future of our merchant marine.

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What the Shipping Bill Is and Does

By Winthrop L. Marvin*

It should be emphasized that it is now costing about $50,000,000 *a year to maintain* 450 *steamers of the Shipping Board. The new shipping bill will aid and encourage, not only these government-owned steamers when they have passed into private hands, but also American private shipping in the foreign trade, now without any assistance whatsoever from the United States. In other words, an expenditure of an amount less than that which the Shipping Board is now paying for the maintenance of its own fleet will, in this bill, cover the entire American merchant marine in overseas commerce.*

JUST what the new shipping bill is and does—just how far it goes in bestowing National aid on the merchant marine—what its cost is and what its duration—all this is well worth pointing out from amongst the more than half a hundred legal pages in which its various terms are meticulously expressed.

In the first place, in its very first paragraph, the new bill broadens the first Jones law, the Merchant Marine Act of 1920, to facilitate the quick sale of the government-owned ships to private capital and enterprise. There can be no shadow of a doubt that all but a few scattering members of both political parties in this country very strongly desire a privately-owned and controlled merchant marine. Advocates of a permanent government-owned shipping are about as scarce in the United States as genuine specimens of the Russian Bolsheviki.

Public opinion emphatically approves the initial provision of the new bill directing the Shipping Board to sell all the government tonnage to "citizens of the United States, except as provided in section 6" of the Act of 1920. This exception permits the sale to foreigners of vessels that are not sought by American purchasers. Under this provision there are now occasional sales to aliens, by authority of the Shipping Board.

In the Merchant Marine Act of 1920, the Board in disposing of its tonnage, is constrained to give heed to the previous prices and replacement costs of ships. Strictly interpreted, that might prove a veto on the disposal for $30 a deadweight ton of cargo craft that in the war emergency had cost $200 or more a ton. Such impossible restrictions are swept away in the present bill, with general approval—for few men would wish to retain an unworkable plan, which would block every effort of the Government to extricate itself from the shipping business. Even those Democrats of the House Committee on Merchant Marine and Fisheries who signed the minority report against the Shipping bill as a whole are careful to protest that "we are opposed to permanent government ownership or operation of merchant ships."

Sale of Ships

Sales of ships, under the proposed bill, must be by "public or private competitive sale after appraisal and due advertisement"—but the Board is empowered to waive advertisement and competitive sale by affirmative vote of at least five of its seven members, making a public record of the reasons for their action. Complete payment of purchase price and interest must be made within 15 years. Interest, payable at least annually, shall be at a rate of not less than 4 percent, and payments of the principal shall be so arranged as to cover at any time depreciation of a vessel—unless the Board waives this requirement on the giving of adequate security by the purchasers. Thus, with the added restrictions and limitations of the law of 1920, there are abundant safeguards of the Government as a seller.

Another new clause amendatory of the Merchant Marine Act of 1920 is a provision in section 2 of the new bill reserving for at least two years the purchase of lines now locally controlled to the local companies now operating these services, with a view to "discouraging monopoly in the American merchant marine." This makes it probable that the new companies organized at South Atlantic and Gulf ports to operate Shipping Board routes will remain in control of those routes under the new policy of cessation of allocation, with National aid to private ownership and enterprise. This is a provision that strongly commends the bill to the favor of the South and Southwest.

In the Merchant Marine Act of 1920, there was authority for the expenditure of $25,000,000 a year for 5 years as a revolving loan fund, at an interest rate of not less than 2 percent, for the encouragement of construction in American yards of particularly necessary types of ships—fast mail steamers of the naval reserve, Diesel-engined cargo craft, etc. This is an expedient that many foreign governments have successfully employed—a notable case was the British government loan for the building of the *Mauretania* and *Lusitania*. In the Shipping bill the authority covers the construction and equipment of special ships, the Government to be protected by a first lien on the vessel. All loans must be repaid within 15 years.

It is to be borne in mind that this is not a gift fund but a revolving loan fund to come back into the Treasury.

Income Tax Deductions

These are the amendments to the Merchant Marine Act of 1920. In section 201 of the new Shipping bill is a very important plan of indirect aid to the merchant marine, amending the Revenue Act of 1921, so that for 8 years from 1921, a shipowner shall be allowed, as a deduction in computing net income, "an amount which bears the same ratio to his net income during the taxable year attributable to the operations of such vessel as his gross income attributable to the foreign operations of such vessel bears to his entire gross income attributable to the operations of such vessel." But this deduction is conditional upon the amount of the deduction being set aside for the building of new ships in private American shipyards. So also any taxable gain on the sale of any ship launched prior to January 1, 1914, may be counted as a deduction if the entire proceeds of the sale are devoted to new construction, or if less than this amount the deduction shall be proportionately reduced. Section 203 of the new Shipping bill amends the Revenue Act of 1921 to make more liberal allowance for actual depreciation of vessel property of all kinds.

Section 204 creates a new and ingenious method of indirect encouragement to the merchant marine by crediting shippers of exports and imports with 5 percent of the amount of freight money paid to American ships, as a deduction in computing Federal income taxes—but it is stipulated that this deduction "shall not be allowed with reference to transactions between persons who are affiliated"—that is to say,

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between corporations one of which owns more than 50 percent of the stock of the other.

Next comes, in section 206 of the new bill, the first provision for the raising of revenue to meet the expenditures. This is in the form of a doubling of the tonnage taxes and light money payable in our ports by all vessels, American and foreign, arriving in the foreign trade. Such an increase will produce a total revenue of about $4,000,000 a year, or double the present amount.

Transportation of Immigrants

A tremendously powerful new agency for the creation and maintenance of a first class naval reserve is embodied in section 301 of the Shipping bill, with its declaration that "as nearly as practicable one-half of the total number of immigrants admitted to the United States in any fiscal year shall be transported in vessels registered or enrolled and licensed under the laws of the United States."

In practical effect this would mean that one-half of the immigrants from the United Kingdom would come in American and one-half in British ships; of the immigrants from Germany one-half in American and one-half in German ships; of the immigrants from Italy one-half in American and one-half in Italian ships, and so on. This plan is so manifestly just and equitable that European shipping interests, which have a mortal fear and hate of the American bill, despair of finding any plausible pretext to defeat it. Their suggestion that commercial treaties forbid such a policy is upset by the well-known fact that before the world war those Europeans themselves had a working agreement by which the carrying of virtually all of our immigrants was regularly monopolized by foreign companies, a certain proportion to each company. Treaty prohibition was then undreamed of, but the bill arms the President with authority to "denounce" any section of any treaty as to which this point may now belatedly be raised.

Naval Reserve Fleet

Most valuable of all ships for National defence are the great, swift passenger carriers of the North Atlantic. Under this immigration section America is assured of as strong a naval reserve fleet as the United Kingdom, thus guaranteeing in logical effect the principle of the Washington 5-5-3 agreement of 1920, under which our naval power was to be equal to Great Britain's and about twice Japan's.

Subvention, subsidy, "compensation," as President Harding justly calls it, first appears in the Shipping bill in section 401 by which the merchant marine fund is established in the Treasury department. This fund is to be made up of the increased tonnage taxes, already alluded to, ($4,000,000 a year); 10 percent of the customs revenue (or about $30,000,000 a year); amounts that but for the general compensation would have to be paid under contract for carrying the ocean mails (except parcel post) (or about $4,000,000 a year), and in addition certain repayments to shipowners. From this fund amounting to from $36,000,000 to $40,000,000 a year, certain specific rates of compensation are to be paid under contract for 10 years to all American vessels engaged in overseas trade, calculated as to cargo vessels to meet the difference between American shipboard wages and subsistence and the wages and subsistence of their chief foreign competitors, and as to the swift mail, passenger and cargo vessels, to cover the difference in wages and subsistence, and also the subventions or subsidies of foreign governments.

Direct Compensation

The Shipping Board is charged with making these contracts only with capable and responsible persons or corporations. In amount this compensation begins with a rate of one-half of one cent per gross ton of a sailing vessel of at least 1,000 gross tons or of a steamer of at least 1,500 gross tons, for each 100 miles sailed in foreign commerce—steamers of from 1,500 to 5,000 gross tons are compensated as of 5,000 tons gross register. Power-driven vessels of a speed of 12 knots or over and less than 13 knots are to have an added compensation of one-tenth of one cent per gross ton for each 100 nautical miles sailed in foreign commerce—and so on by a carefully proportioned scale up to an additional two and one-tenth cents per gross ton for 100 nautical miles sailed by steamers of 23 knots and over. Mileage is to be measured by direct customary routes. On this basis, a 5,000-ton cargo steamer of 10 knots speed might receive a compensation of about $7,500 a year, while the 24-knot *Leviathan* of 54,000 tons might receive $900,000—a sum not out of proportion to what the British Government has long been paying the Cunard Company for similar service.

To emphasize the fact that all this compensation for either cargo craft or giant liners is for actual service rendered, certain conditions of National importance are established. In order to receive this compensation, ships must be already registered or hereafter built in the United States —with certain special exceptions. They must hold the highest classification of the American Bureau of Shipping—the "American Lloyds"; they must be self-propelled by sails or machinery, and must carry officers who are duly certificated American citizens, and crews exclusive of officers at least two-thirds of whom after two years are American citizens, the remainder to be persons eligible to citizenship. It is emphasized again that this compensation is given only to ships engaged in foreign commerce, and voyages in such commerce are strictly defined.

No compensation under the Act is to be paid to ships not of private ownership or not owned by citizens of the United States. After three years no company whose own or chartered tonnage, or the tonnage of whose affiliated companies, is not at least 75 percent of American register shall be eligible for compensation.

Wisely, some discretion is given to the Shipping Board to increase the rate of compensation by a record vote of five out of seven members, on routes where especially intense foreign competition makes this necessary—but the increase shall not be more than double. The Board is also authorized to reduce the rate of compensation where the rate seems excessive, with the consent of the other party to the contract.

Vessels receiving compensation may be requisitioned by the Government at any time for National defence or in a National emergency, on a basis of fair actual value, but in no case "shall such fair actual value be enhanced by the causes necessitating the taking." All repairs or reconditioning of compensated vessels must be made in the United States or its possessions (except such repairs as are necessary to the safety of the vessel) on penalty of withdrawn compensation.

Ocean Mail Service

Steamers receiving compensation must carry free of charge all ocean mails except parcel post. Owners whose vessels earn a net income of more than 10 percent must pay 50 percent of the excess to the United States, "but in no case shall the amount so to be paid exceed the amount of compensation earned in respect to such vessel." This requirement, of course, is intended as a vigorous check on profiteering.

All army or navy transport services are to be discontinued wherever the President finds that adequate facilities exist in private hands, and the government-owned transports are to be turned over to the Shipping Board or laid up, while the requisite services are to be performed by privately-owned American vessels under contract. All government officers must travel on American steamers whenever available, if

(*Continued on page* 642)

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Standardizing Ocean Bills of Lading

By Robert E. Annin

It is safe to assert that a very large proportion of ocean shippers today have little realization of the conditions to which the acceptance of the ordinary form of bill of lading may bind them; and the substitution of one well-digested and carefully framed code for a mass of unknown verbiage of uncertain effect would in itself be a great protection to all shippers, even to those who did not know the provisions of the code itself. At least they would be guaranteed against certain lopsided absurdities which might practically deprive them of vital rights.

IN view of the vital character of the bill of lading as a receipt, an evidence of contract and a collateral document, it would, at first glance, seem surprising that there is not yet in general use a form so definite in its statement of ordinary responsibilities and exemptions, as to be satisfactory to the interests necessarily involved—that is to say the carrier, the underwriter and the holder for value (which includes the shipper or his assignees). For with the rapid growth of international trade, for over a century, there has been devoted to the problem a wealth of ability—commercial, financial, legal and judicial—which, it would seem, should have been sufficient to reach a result reasonably satisfactory to all parties concerned.

It is only when one considers the possible complications arising from sea-perils, the infinite variety of goods transported, diversity of voyages and the differences in jurisdictions which enter into international trade, that the obstacles to a just and comprehensive form of bill of lading can be appreciated.

In view of these factors, the best conceivable form could do no more than reduce the inherent risks of dispute and litigation, even if special forms could be devised, covering every kind of merchandise, on any possible voyage, under every possible combination of conditions, which is obviously impossible.

Since the bill of lading form usually originates with the carrier (who naturally protects himself to the utmost), the demand for reform has come either from the cargo owner (or his assignee) or from the underwriter, who assumes most of the liabilities for loss or damage which cannot be collected from the carrier.

And as a negotiable bill of lading is not only an evidence of contract for carriage, but the vital document in the set of commercial collateral, all provisions which leave in doubt the relative risks and liabilities of the parties in interest, must tend to impair its value and act as a potential cause of injustice to any holder.

Clear Definitions Important

Hence the interest of the underwriter in a clear definition of the carrier's responsibilities is obvious; for only so may he intelligently estimate his own risk.

To the banker it is essential that, if his security be impaired by loss or damage, he shall have well-defined recourse against either the ship or the insurance. Otherwise he may risk falling between two stools, with no remedy, save in a dilatory and expensive litigation.

A curious case which occurred some years ago will illustrate this point. A shipment of cotton sheetings, in transit by a passenger and freight liner, was seriously damaged by the leakage of a bathroom pipe. The underwriters referred claimants to the carrier, holding that "sea peril" did not cover the kind of damage sustained. On the other hand the carrier rejected the claim, on the ground that the leakage was caused by straining of the ship, and consequently the damage was due to "sea peril." Whether the plumbing was originally defective, or the break caused by stress of weather on the voyage, seemed impossible of proof. The dispute dragged along for some months, when the underwriters, under pressure, accepted the liability and paid the claim in consideration of cargo owner's assignment of their claim against the carrier. Eventually, an amicable settlement was made by which carrier and underwriters each bore one half of the total loss.

In this particular case the shipper was a large insurer, with an enviable record as to claims, while the claim was not large. Furthermore, the essence of the matter lay in a question of fact, rather than of interpretation. But it is a clear example of the possible loss involved to an innocent holder of the bill of lading, whenever the line is not clearly drawn between the liability of the carrier and that of the insurer.

Unjust Exemption Clauses

Hence the demand for legislation which shall restrain carriers from inserting in their forms, unjust, obscure or tricky clauses, exempting them from their just responsibilities and transferring to other parties in interest the risks for which the ship is properly liable.

The conditions of international trade during the years just passed have brought this matter to an acute stage. For the collapse of markets, credits and exchanges has loaded bankers with "frozen credits." Drawees have failed to meet their drafts; drawers have been unable to take them up and the holder's sole tangible security has been the value of goods. When to this is added the fall in price and the anxiety of both owners and underwriters to plead any technicality to escape payment of claims the urgent demand for bill of lading reform is easily understood.

The trouble, at this juncture, has been further intensified by unusual and unjust exemption clauses inserted in their form by some carriers, under the plea of "war conditions"; and which in many cases have survived the emergencies which served as their excuse.

While the war lasted, and for a year thereafter, the insufficiency of tonnage was so great that shippers were willing to accept almost any bill of lading so long as their goods were moved.

A glaring instance of this kind is the following clause inserted in a "war" bill of lading and accepted without demur by many shippers:

"For the purpose of ascertaining the amount of freight to be charged, the shippers shall make a written declaration, before shipment, of the true contents and value of each package; and any failure to make such declaration, *or the making of any incorrect or insufficient declaration, shall release the carriers from all responsibility and shall entitle them to charge double freight,* calculated according to the true contents and/or value of the goods."

The effect of such a clause upon the value of the bill of lading as collateral needs no comment. That it would receive judicial sanction is doubtful, but that it would cause litigation is very certain; a fact which of itself greatly impairs the value of any collateral document.

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STIPULATIONS NOT NECESSARILY FINAL

While a bill of lading as a contract is not assailable by parole evidence and while the courts are disinclined, for obvious reasons, to nullify its express stipulations, it cannot be assumed that its provisions are necessarily final in all cases. A long standing decision on this point holds the following language:

"A bill of lading is not the contract, but only evidence of the contract; and it does not follow that a person who accepts the bill of lading which the shipowner hands him is necessarily and without regard to circumstances bound to abide by all its stipulations."

The same decision held that in case of novel or unusual clauses, vitally affecting the ship's liability, the shipowner is obligated not only to make it plain in words, but conspicuous in type and position.

Further, courts have long shown an increasing tendency to interpret the bill of lading along lines which reasonably recognize its vital importance in international commerce, and the special risks to which bankers and underwriters may be subjected without a fair chance to protect their interests. A clear division of liabilities and risks incident to ocean transportation is one of the roots of a safe international commerce.

For such reasons the call for standardization has become increasingly clamorous and has taken form in two directions:

(a) By a movement acting through the British Board of Trade for legislation on the subject to cover all British territory.

(b) By the formulation of a code of international regulation which has become widely known as the "Hague Rules."

The former may be framed either on identical lines with the Hague Rules, or (as has been proposed) upon the model of the existing Canadian Act; in which case its effect would be restricted to the British Empire itself. The latter would require the assent of the interested Governments to become generally effective. There is a strong movement to accomplish the adoption of the Hague Rules through action of our own Congress. It is true that much of the ground which it is sought to cover has been already covered in the Act of Congress of 1893, known as the Harter Act. But the latter is 30 years old, has shown some hazy spots and could undoubtedly be improved in the light of so many years of experience and judicial review.

NO CODE CAN COMPLETELY COVER EVERY TRADE

As before stated, no code could be attempted which should provide a complete form for every trade, every jurisdiction and every class of cargo. The aim is rather to frame a set of rules which shall be clearly expressed, easily grasped and which being briefly made a part of all bills of lading (by the same method now used to give effect to the Harter Act and the York-Antwerp Rules) would not only accomplish the purpose desired, but by such method would automatically shorten and simplify the bill of lading form. This is in itself an end worth achieving, for the interminable length of many forms now in use is an injustice to shipper, banker and underwriter, only less than that caused by unconscionable provisions.

The Hague Rules were originally drafted by the Maritime Law Committee of the International Law Association, in the endeavor to lessen and, if possible, remove the universal friction between carriers and holders of bills of lading which has been growing for years; but which became particularly acute about the end of the war period. Previous to this, the Prime Ministers of Great Britain and her Dominions had moved in the same direction and British legislation was already in prospect which should cover all that Empire, but would of course be ineffective beyond its boundaries. The purpose of the International Law Association has been to broaden the movement, so that, by the formulation of a code acceptable to all the martime nations, the reform might be made of world scope.

INTERNATIONAL CODE FRAMED AT THE HAGUE

At a general conference of the International Law Association, which met at The Hague in August last, the rules drafted by their Maritime Law Committee were submitted, exhaustively discussed and (after certain amendments) this code, known from the town of its adoption as the Hague Rules, was adopted unanimously.

The ability and time given to the framing of these regulations have given them such prestige, and wide discussion of their provisions has so justified their wisdom and fairness, that there is good hope that many of the maritime nations, headed by Great Britain, may adopt the essence of the Hague Rules as a part of their maritime law. The International Chamber of Commerce is taking an active interest in promoting the movement and a majority of those interested in this country are in hearty accord with their purposes.

It will not be practicable in the space available to quote the rules in full and comment thereon; but a brief summary of the provisions of the various sections with some comments on the more vital should be of interest.

ARTICLES I AND II

In the Hague Rules as written Articles I and II are formal, the first defining the essential terms "Carrier," "Contract of Carriage," "Goods," "Ship" and "Carriage of Goods." The second makes the rules binding upon the carrier.

ARTICLE III

Article III is devoted to the carrier's responsibilities and liabilities. Section one of this article states the ends toward the accomplishment of which the carrier is obligated to exercise due diligence "before and at the beginning of the voyage."

Section two provides for loading and discharging and care of cargo while in carrier's custody.

Section three treats of the issuance of bill of lading, on demand of shipper as soon as goods are in carrier's custody; and of the descriptive details which such document shall show.

Section four provides that (with the exception of bulk goods) the bill of lading shall be prima facie evidence as to marks, quantity, description and condition, at time of shipment.

Section five is, on its face, for the special protection of the carrier, but in effect it is for protection of the shipper against just such clauses as the one quoted some time back. It provides that the shipper shall indemnify the carrier for any loss, damage or expense resulting from inaccurate descriptions.

Section six treats of claim for loss or damage; of the giving of notice by claimant, and discharges the carrier in respect of loss or damage, unless suit is brought within twelve months after delivery of goods.

Section seven provides that shipper shall be entitled, when goods have been loaded, to demand a bill of lading stating that goods have been "shipped" instead of "received for shipment"—a point upon which later comment is to be made.

ARTICLE IV

Article IV treats of the rights and immunities of ship or carrier.

Section one has broadly the effect of the Jason Decision under the Harter Act in exempting the owner for unseaworthiness not caused by lack of due diligence on the part of the carrier.

Section two is in effect the provision setting forth the exemptions to which the carrier and/or the ship are justly entitled. It is notable for its relative brevity and clarity, being content with the more general descriptions of causes of loss for which the carrier shall not be responsible, instead of attempting an impossible completeness of detail. For such detail is substituted one last paragraph (q) which specifies among the exemptions

"Any other cause arising without the actual fault or privity of the carrier; or without the fault or neglect of the agents, servants or employees of the carrier."

Section three contains the deviation clause.

Section four limits carrier's liability to £100 per package, unless a higher value be declared by the shipper, before shipment, and inserted in the bill of lading. Herein is covered one of the points which have caused complaint, friction and conflict.

Section five exempts carrier or ship from responsibility for all loss or damage in connection with goods the nature or value of which has been *wilfully* misstated by the shipper.

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Section six grants to the carrier full freedom of protective action in regard to dangerous cargo, the nature of which has been concealed by the shipper; deprives shipper of any claim for compensation and makes him liable for all loss or damage due to his failure to declare the true nature of the cargo.

ARTICLE V

Article V provides for goods carried under special agreements not in accord with the preceding rules. Such contracts are to be legal but no negotiable bill of lading is to be issued under them. In lieu thereof, the agreed terms are to be embodied in a receipt, marked *"not negotiable."* The effect of this rule, in preventing the misleading of holders for value through special agreements between shipper and carrier, as well as placing the sole onus of such agreements upon the parties directly assenting to them, is very clear.

The code as proposed is mainly drawn along the lines of the Harter Act, and like that law, it is primarily intended for the protection of other interested parties against arbitrary and unjust provisions dictated by the carrier or ship.

In the provisions for due diligence it is plainly implied that the burden of proof that such due diligence has been exercised shall rest upon the carrier. The cargo owner does not have to prove negligence. This might be made clearer by direct expression, but the intent appears unmistakable. In brief the Hague Rules aim (as does the Harter Act)

(1) To prohibit the evasion of certain vital obligations by the carrier.
(2) To clearly and tersely define the just exemptions of the carrier.

The ultimate purpose is to make the application of such prohibitions and definitions general, instead of (in the international sense) local.

But this code also covers certain matters long in controversy upon which the Harter Act does not touch.

Specifically in Article III, Section 6, it is stipulated that in the absence of written notice of claim served upon the carrier at port of discharge before removal of the goods, such removal shall be prima-facie evidence of delivery. Further that failure to bring suit within 12 months of delivery shall discharge the carrier from all liability in respect of loss or damage. This is in sharp contrast with clauses commonly in use which, in some cases, have exempted the carrier absolutely unless written notice of claim be served within ten days of removal; and limiting to three months the period within which suit may be brought. Clearly, in view of the possibilities of delay in the detection of damage (arising from transshipment, warehousing, and other causes), the period for the absolute exemption of carrier has often been too short. The acceptance of the goods being made *prima facie* evidence of delivery places the burden of proof of damage upon the cargo, but does not absolutely release carrier.

In view of the time and labor required in seeking and formulating evidence, the difficulty of locating witnesses, etc., the period of one year allowed for the beginning of litigation appears reasonable.

Much trouble and confusion has resulted from the issuance by carrier of bills of lading which failed to name definitely the vessel upon which cargo had been shipped. Presumably this practice arose with the use of "Through Bills of Lading" where (owing to uncertainties of transport to seaboard) it was impossible to guarantee that a given consignment would arrive in time for shipment by a given ship. Carriers were quick to perceive the advantage to themselves of a form which, instead of binding them to the statement that the goods were *"Shipped per"* a given vessel, merely stated that goods had been *"Received for shipment per———"* or succeeding vessel of the same line. Under the latter form the privilege to the carrier of selecting the most profitable cargo for immediate shipment, and of shutting out less desirable consignments led to infinite confusion, trouble and loss. Not only were split shipments common, but shipper, consignee, banker and underwriter were often uncertain regarding the identity of the vessel to which their risks attached. This form was therefore a convenience to the ship but an injustice to all other interests.

Hence in Article III, Section 7, it is provided that when goods are actually aboard, the shipper shall be entitled to demand, and the carrier must issue, a *"Shipped"* bill of lading, provided no *"Received for shipment"* bill of lading has previously been issued.

But, if the latter has been already issued, it shall (on goods being laden and on demand of shipper) be exchangeable for a "Shipped" bill of lading; or a "Received for Shipment" form may acquire the standing of a "Shipped" form, by proper notation of name of ship and date of lading, by the carrier, master or agent.

This does not altogether avoid the complications of a "Received for Shipment" form, but certainly greatly modifies them.

CARGO OF UNUSUAL VALUE

The reform of another abuse is covered in Article IV, Section 4. That the carrier may have some knowledge of the risks which he undertakes it is essential that he be informed concerning cargo of unusual value. In regard to precious stones or metals, securities, laces, furs, and certain other valuable commodities, which are subject to special perils of theft or damage, the ordinary bill of lading requires a special declaration of the shipper at the time the engagement is made. This is clearly just, since the carrier's risk as to loss and damage is in proportion to the value of the goods carried and he is entitled to be warned in advance regarding any items which are subject to peculiar risks, in order that proper protection may surround them.

But also to cover this matter in a more general way there has been a customary clause placing a maximum risk *per package* on all goods the value of which has not been declared in advance by the shipper.

As it is to the interest of the carrier that this maximum should be as low as possible the tendency has been to reduce it below a reasonable figure to the great disadvantage of the shipper in case of loss. Article IV, Section 4, places this general maximum at £100 per package also providing that, by special agreement any other maximum, *not less than* £100-0-0, may be substituted.

This section also very properly stipulates that shipper's declaration shall only be *prima facie* evidence as to value, etc., but shall not be binding upon the carrier. Otherwise it might be claimed that acceptance of declaration of value would estop the carrier from later disputing its accuracy, thus opening the door to a very obvious kind of fraud.

These are the main features of the so-called Hague Rules which, to be made fully effective must be made part of the statute law of the great maritime nations.

As this is written the subject is under active discussion in the United Kingdom and many suggestions of amendment and alteration have been made. The tendency of most of these, however, seems to be toward greater simplicity and definiteness and indicates that the British interests involved are in dead earnest in their endeavor to better present conditions. Presumably this process will have to be gone through with each national parliament and the consequent delay is quite likely to endanger the general success of the Hague Code. In the interest of international trade it is to be hoped that this movement will succeed. The unification of law and practice in respect of these matters would simplify and therefore facilitiate international commerce. Whatever does this is in the long run beneficial to both owner and operator; while the interests of bankers and underwriters are too obvious to need comment.

Hence the speedy success of these rules is greatly to be desired in the interest of ocean trade.

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Recent Developments in Marine Insurance

Deviations for Fuel—Pilferage Liability—War Clause Altered—Proposed State Law—Shipping Destroyed in 1921

By "Bordereaux"

COAL shortage continues to be the cause of considerable anxiety to marine underwriters, for more reasons than one. They are checking up on voyages with the greatest care, watching particularly for deviations for fuel. Recently several English vessels that loaded at New York for the River Plate proceeded to Sydney, Cape Breton Island, for coal, not having been able to fill their bunkers here. They found at Sydney that they could not secure a sufficient supply and were obliged to go to Norfolk to get it. All this involved extensive and perilous deviations and the underwriters, very properly, charged an additional premium of from one-eighth to twenty cents. Many serious hazards are caused by these entries into other ports than those contemplated in the prescribed voyage. Collisions are always possible and the peril of fire damage is never absent when hatches are opened for the reception of coal.

Would Sue the Government

PERMISSION to bring suit against the Federal Government is something the marine underwriters are very desirous of securing. Behind it lies the important question of the liability of the Government for war damage. The insurance men want to see the Husted bill, now pending before the Congress, reported out of committee; if this measure can not be passed, they want a new bill introduced. The Husted bill seeks to secure permission to bring suit against the Government. A few days ago a special meeting of marine insurers was held at New York for the purpose of inaugurating an inquiry of nation-wide scope into the liability of the United States Government for war damages. It is desired to have this action taken up all over the country, as in such an event it would present vastly more strength than if pushed by any local interests. William H. McGee presided, and the meeting authorized him to appoint a committee that should study the situation and devise ways and means for meeting it. After mature consideration Mr. McGee made the following appointments to the committee, of which he himself will act as chairman: Curtis L. Clay, Philadelphia, representing the Insurance Company of North America; W. H. Jones, of S. D. McComb & Company; H. E. Reed, of the Fireman's Fund; H. A. Warden, of the Automobile; and G. B. Ogden, of Chubb & Son.

Havana Trouble Feared

THERE appears to be good reason for fearing the development of another period of congestion at Havana approximating in extent the chaotic conditions that prevailed there a few months ago. The Cuban Government has discharged more than one-half of the Post Office employees, and these were experienced hands who knew how to handle the routine of the Department. Singularly enough, those who were retained are novices who have it all to learn. The result has been confusion. Many stacks of mail are waiting to be distributed, and there is no doubt but that in those heaped-up pouches are reposing numerous documents for merchants who are expecting shipments by incoming steamers. Should these clearance papers fail to be delivered by the Postal authorities to the merchants, the cargo, when discharged, must unavoidably accumulate on the docks until the necessary customs documents are received.

Foreign Pilferage Liability

SHIPOWNERS and operators will find much to interest them in the query and answer herewith referred to respecting the problem of how far the specific stipulations in a bill of lading (trans-oceanic shipment) may be regarded as null and void, if at all, owing to their infringement of the provisions of the Harter Act. Trade Commissioner Julian E. Gillespie recently submitted to the Division of Commercial Laws a case of disputed liability for pilferage which occurred in the port of Constantinople. The Division referred the matter for opinion to a firm of well-known admiralty lawyers of New York, the substance of whose reply is as follows:

It has been repeatedly held by our courts that the Harter Act applies to foreign vessels which come within the jurisdiction of American courts as well as to American vessels, provided the loss or damage complained of occurred on a voyage to or from a United States port. If the consignee takes delivery of his goods, any damage arising thereafter cannot be imputed to the ocean carrier. Although the question of liability for damage upon lighters at destination is constantly recurring, the effect of the Harter Act thereon, curiously enough, has never been passed upon by our courts. There are decisions holding where cargo is laden upon unseaworthy lighters hired by a steamship company and used to carry cargo to the vessel that the voyage first commenced when the cargo was laden on board the lighter, and the unseaworthiness of the lighters renders not only the owners of the vessel liable for the loss ensuing but also renders the vessel liable *in rem.*

Upon the same principle the legal advisers express the opinion that, if upon a vessel's arrival at destination cargo is laden upon lighters employed by the carrier for transportation to the shore, the steamship company is liable for a loss that arises either through the unseaworthiness of the lighter or through improper custody and care of cargo on the lighter, inasmuch as, in their judgment, the lighter is a substitute for the vessel to complete its contract of carriage. Bills of lading, it is true, almost invariably contain a provision that the steamship company or the vessel shall not be liable for loss arising after transshipment, "but we are of opinion," said the attorneys, "that the transportation of goods upon lighters does not come within the meaning of such a clause, as lighters are not really independent carriers but are merely auxiliary to the real voyage."

They also feel that inasmuch as a voyage has been declared by the courts to start when goods are laden upon a lighter provided by the carrier to carry the goods to the vessel (Bulkley *v.* Naumkeag Steam Cotton Company, 24 Howard 286), it would seem to follow logically that the voyage does not terminate until the goods are discharged upon the dock, at the termination of the voyage, where the carrier furnishes the lighter. Whether it be considered that the goods are still in transit or are in course of being discharged from the vessel, these attorneys maintain that the provisions of the bill of lading in reference to the liability of the steamship company for loss or damage to the goods while on the lighter are governed and limited by the provisions of the Harter Act.

Sections 1 and 2 of the Harter Act provide that a carrier cannot lawfully exempt himself by a provision in the bill

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of lading from liability for loss arising from negligence or fault or failure in the proper custody, care or proper delivery of any lawful merchandise committed to his charge and that any such provision in a bill of lading shall be null and void and of no effect. It is the opinion of these attorneys that it should properly be held that the goods are still "committed to his (carrier's) charge" and are being "delivered" by him while the goods are on the lighter.

The final conclusion of this interesting opinion is as follows: "The inclusion in the bill of lading of a clause that the carrier shall have liberty to convey the goods upon lighters at the risk of owners is a provision rendered null and void by the provisions of the Harter Act (Section 1), and if loss or damage arises to the cargo on the lighters through unseaworthiness or through negligent care and custody of the cargo, the steamship company may be held liable therefor in a suit *in personam* and probably the vessel also held liable *in rem*."

Influence of the Greco-Turkish War

UNDERWRITERS are becoming increasingly wary about covering shipments to and from Asia Minor in view of the possible influences of the war between Greece and Turkey. Goods destined to either one of the belligerent countries are exposed to increased war hazards. Recently an important decision was handed down regarding liability for seizures of the property of the assured by de facto governments, and a considerable number of underwriters are now employing an altered war clause to conform to this requirement. De facto governments are not regarded as governments within the meaning of the clause. The new form is as follows, the italicized portions being the recent additions:

"Including direct loss and/or damage caused by strikers, locked-out workmen or persons taking part in labor disturbances, riots, civil commotions or explosions, the result of unlawful acts, but, notwithstanding anything to the contrary, either expressed or implied herein, or in the policy to which this endorsement is attached, this insurance does not cover and is hereby warranted to exclude claims for delay, deterioration or loss of market, or for confiscation or destruction by the Government, *and/or de facto Government*, of or within the country in which the property is situate and/or the Government, *and/or de facto Government of seceding or revolting States.*

Proposed State Law

AT the meeting of the National Convention of Insurance Commissioners, held at Swampscott, Mass., on September 5-7, representatives of the American Institute of Marine Underwriters submitted a draft of the proposed uniform State marine insurance law as prepared by counsel to that body. It is largely based upon the new Marine Law of the District of Columbia, with certain alterations that should render it more acceptable to insurance men at large. The purpose is to have legislation of this character approved and advocated by the supervising authorities of the States, to the end that the conflicting requirements of the States may be smoothed out and American marine underwriters be afforded a uniform and scientific basis upon which to build up a business in keeping with the requirements of our new merchant marine. It is now up to the Committee on Laws and Legislation of the Insurance Commissioners. Of this important and essential legislative suggestion it may be said:

1. It has not been drafted in the interest of any particular State or group of States but as a practical and necessary aid to the development and advancement of the interstate and foreign commerce of the United States and the better to enable American shipowners, merchants and marine underwriters to meet world competition.

2. It has not been drafted in the interest of corporate insurers as distinguished from mutuals, inter-insurers or individual underwriters; its aim is to be fair to all and to provide equal opportunity for all.

3. The proposed State act does not intend to, nor does it, alter or restrict the complete control of the supervision, regulation or taxation of marine insurance by the States or by State officials.

It leaves untouched, or rather, it perpetuates, the supervisory powers of State commissioners of insurance. Its sole endeavor is to obtain substantial State uniformity of regulation and taxation in respect to a business which is of national concern and unique in character.

4. Its purpose is "to define, regulate and tax marine insurance," not to prepare an insurance code covering matters of substantive law as in the code States.

Shipping Destroyed in 1921

A REPORT upon disasters to vessels during 1921 has been issued by *Lloyds Register*. It includes those that were lost at sea, broken up, condemned or otherwise removed from trade, and the grand total is 559 ships with a tonnage of 674,257. Of these, 344 were steamers and motor vessels, with an aggregate of 536,537 tons, and the balance sailing ships. Strandings and kindred casualties which are comprised under the term "wrecked" are the most prolific cause of disaster. To such casualties are attributable 45.16 percent of the losses of steamers and motor vessels and 38.8 percent sailing vessels. Cases of abandoned, foundered and missing vessels are, no doubt, frequently more or less similar in the circumstances of loss. If these be taken collectively, they form 30 percent of the steamers and motor vessels and 35½ percent of the sailing vessels removed from the mercantile marine during 1921, owing to casualty.

Of the 310 steamers and motor vessels totally lost, condemned, etc., during the year, 65 of 65,718 tons gross (0.34 percent of tonnage owned) were registered in the United Kingdom; 35 vessels of 42,332 tons (1.87 percent) in the British Dominions; 22 of 60,392 tons (0.45 percent) United States; 8 of 5,536 tons (0.63 percent) Denmark; 21 of 27,899 tons (0.85 percent) France; 12 of 7,005 tons (1.07 percent) Germany; 26 of 52,363 tons (8.92 percent) Greece; 2 of 602 tons (1.14 percent) Italy; 29 of 51,185 tons (1.53 percent) Japan; 16 of 28,210 tons (1.23 percent) Norway; 30 of 53,772 tons (4.84 percent) Spain; 8 of 9,693 tons (0.89 percent) Sweden; and the balance of 21 vessels owned in other countries.

As regards material of construction, 186 vessels of 360,449 tons were of steel; 45 of 46,206 tons of iron; 5 of 2,508 tons of ferro concrete; and 75 of 49,829 tons of wood and composite. Of the sailing ships totally lost, etc., out of the total of 193 vessels of 121,834 tons, 50 vessels of 46,753 tons were owned in the United States. The amount of tonnage broken up, dismantled, etc. (not in consequence of casualty) in 1921 was 93,431 tons.

International Oil Pollution Parley

MARINE insurance men are naturally greatly interested in the official announcement from Washington to the effect that President Harding has authorized Secretary of State Hughes to enter into negotiations with the principal maritime nations of the world for a conference in the United States for a discussion of means of preventing oil pollution of navigable waters, especially in important harbors. No date for the parley has been intimated as yet. This action carries out a resolution adopted by Congress requesting the President to call such a conference. The State Department proposes at once to start an inter-depart-

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mental inquiry along broad lines with the purpose of working out possible ways and means of solving this grave problem so far as this country is concerned. Every department of the Government using ships, the Shipping Board, Public Health Service, Biological Survey and the Bureau of Mines will participate in the inquiry. The problem involves finding a practical way to overcome the pumping out by tank steamers or oil fuel vessels of ballast water when nearing port, the ballast water having come from tanks which previously contained fuel oil and carrying with it into the sea a scum of heavy oil.

Japan Hull Risks

LONDON, during recent years, has been receiving a considerable amount of hull business from Japan, in the form of reinsurance of Japanese companies. Hitherto this business has gone exceedingly well but of late there have been complaints that the risks which are being sent are not of the best, while the rates paid are far from being satisfactory. The reinsurances are, for the most part, effected under a twelve-monthly contract and, although it is now too late to undo any harm that has been done, underwriters are keeping the matter under close observation for future regulation of their action.

Shipping Board to Conserve Coal

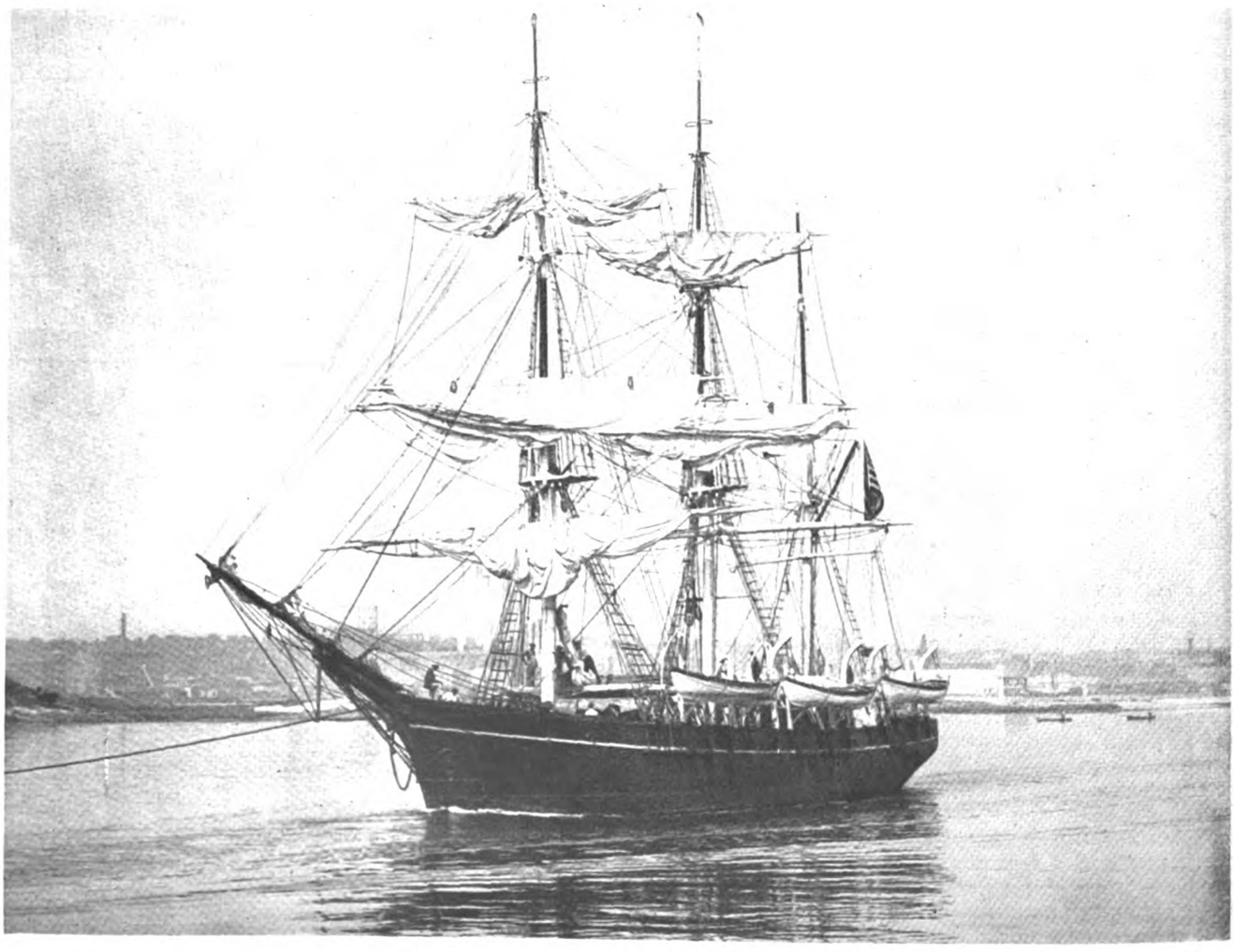
A FUEL Conservation Section, with headquarters at 45 Broadway, New York, has been established by the United States Shipping Board Emergency Fleet Corporation, according to Operations Order No. 16, issued by Joseph E. Sheedy, vice-president of the Emergency Fleet Corporation.

This Section is the active arm of the Fuel Conservation Committee and the specific duties entrusted to it are to make practical and technical studies of the methods of operation of vessels as regards their motive power and to suggest and promulgate means to improve these methods and consequently reduce the fuel bill of the Fleet Corporation.

This Section may require assistance of various kinds from time to time from other Departments in order to further its work. All Department officials and employees of the Corporation are requested to co-operate to the fullest extent in bringing about the desired results.

C. J. Jefferson is designated as Head of this Section and will be in active charge of its work.

The Fuel and Operating Departments of the Corporation will continue to function as heretofore in connection with the purchase, receipt and use of fuel.



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Whaler Leaving New Bedford, Mass., for an Atlantic Voyage

The sailing of a whaling vessel from New Bedford Harbor, which years ago used to be a common sight, is now an unusual event. The above illustration shows the recent departure of the whaling bark WANDERER from this port for Cape Verde Islands to recruit a crew for an Atlantic whaling voyage, under command of Captain Joseph Edwards

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The New 17,200-Ton Anchor Liner Tuscania

Latest Type of Present-Day Passenger Liner Practice Arrives in New York—Replaces Namesake Lost During War

ALTHOUGH there has been a large amount of passenger liner tonnage completed in English shipyards since the armistice was signed it is worthy of note that not one mammoth liner has been projected or designed. All of that type which have been put in service are simply completions of pre-war projects.

The Cunard Company has been the leader in the post-war practice of building vessels of the intermediate type of between 13,000 and 20,000 tons. These vessels, however, contain many of the comforts and conveniences that were formerly only to be found in the monster greyhounds. In other words, they are comfortable without being too luxurious and therefore adapted to the needs of the average pocketbook rather than that of the millionaire.

One of the latest vessels of this class to be completed is the *Tuscania,* which arrived in New York on September 27. The *Tuscania* was built for the Anchor Line (Henderson Bros.) service between Mediterranean ports and the United States and is fitted out in accordance with the emigrant regulations of Great Britain, Italy and the United States.

The Anchor Line practice of perpetuating the names of its vessels has been carried out in this case and the new vessel is named after an earlier *Tuscania* which was built in 1915 and lost during the war. The new vessel is slightly larger than her namesake and having more erections is also both wider and deeper, the gross tonnage being thereby increased from 14,348 to 17,200.

Main Particulars

The *Tuscania* is a twin screw passenger and cargo steamer and will be propelled at a speed of 17 knots by Brown-Curtis double reduction geared turbines of 13,500 shaft horsepower. She is of the same dimensions and generally similar to the recently completed *Cameronia* but has an additional deck amidships and consequently more space available for the accommodation of passengers.

The leading particulars are:

Length over all	578 feet	6 inches
Length between perpendiculars	550 feet	
Breadth molded	70 feet	
Depth to bridge deck	51 feet	3 inches
Load draft	28 feet	11¾ inches
Deadweight	about	10,700 tons

The vessel has been constructed under special survey to the Rules of the British Corporation, and is fully in accordance with the recommendations of the International Convention for the Safety of Life at Sea, a standard largely in excess of the present legal requirements as to sub-division. She is of the shelter deck type and has a straight stem and cruiser stern, and will be fore and aft rigged with two masts and one funnel. There are in all eight decks, viz.: lower, main, upper, shelter, bridge, lower promenade, upper promenade and boat deck.

Construction of Hull

The vessel is subdivided into eleven main transverse watertight compartments by ten watertight bulkheads, the fore peak bulkhead is carried up to the bridge deck while the others extend to the shelter deck. All watertight doors below the waterline are worked on the Stone-Lloyd system, also by gearing from the shelter deck. Fire resisting bulkheads with fireproof doors are fitted in the accommodation spaces above the shelter deck.

A double bottom is fitted all fore and aft between the peak bulkheads, and is utilized for carrying oil fuel, reserve feed water and water ballast. The fore peak tank is used for either fresh or salt water and the aft peak for water ballast.

Passenger Accommodations

The passenger accommodation is all situated above the main deck, the spaces beneath that deck being devoted to the carriage of cargo, ship's stores, machinery and bunkers. Three classes of passengers are carried and the accommodation is so arranged that a number of the rooms are interchangeable to either first or second class, the third class being berthed in open berths on the main and upper decks. The following are the numbers of passengers and crew for whom accommodation is provided:

First class	104
First interchangeable to second class	163
Second class	377
Third class (open berths)	1,818
Officers and crew	342
Total persons on board	2,804

The first class accommodation is all arranged on the lower promenade deck and consists of rooms for one, two and three passengers. The first and second class interchangeable rooms are mostly on the bridge deck, with a few on the shelter deck. These rooms accommodate from one to four passengers. The staterooms throughout are fitted with beds, settees, washbasins, dressing tables, wardrobes, and are complete with all furnishings necessary for the comfort of the passenger.

First Class Public Rooms

The first class public rooms, comprising dining saloon, lounge, writing room, smoking room, gymnasium and verandah cafe, are all large and airy apartments tastefully decorated and furnished. Their sizes are:

Dining saloon	52 feet by 68 feet by 8 feet 6 inches
Lounge	24 feet by 38 feet by 12 feet
Writing room	14 feet by 34 feet by 8 feet 6 inches
Smoking room	36 feet by 38 feet by 8 feet 6 inches
Gymnasium	14 feet by 29 feet by 12 feet
Verandah cafe	14 feet by 38 feet by 8 feet 6 inches

The dining saloon is situated on the upper deck and is entered direct by the main staircase. It occupies the full breadth of the ship and is surmounted by a large dome and musicians' gallery. Dining accommodation is provided for 158 passengers arranged at small tables accommodating from four to twelve persons, the floor area being about 20 square feet per person accommodated.

The remainder of the public rooms are in the deck house on the upper promenade deck. The lounge is at the forward end of the house just forward of the main stairway, the writing room alongside the funnel hatch, the smoking room between the funnel and engine hatches, the gymnasium aft of the engine hatch and the verandah cafe at the aft end of the deck house.

Second Class Accommodations

The second class public rooms include a dining saloon, lounge and smoking room. The dining saloon, 64 feet by 68 feet, is on the upper deck and has dining accommodation for 256 people. This can be increased to 272 by extending some of the tables, the floor area being then 18 square feet per person. The tables are arranged to accommodate from

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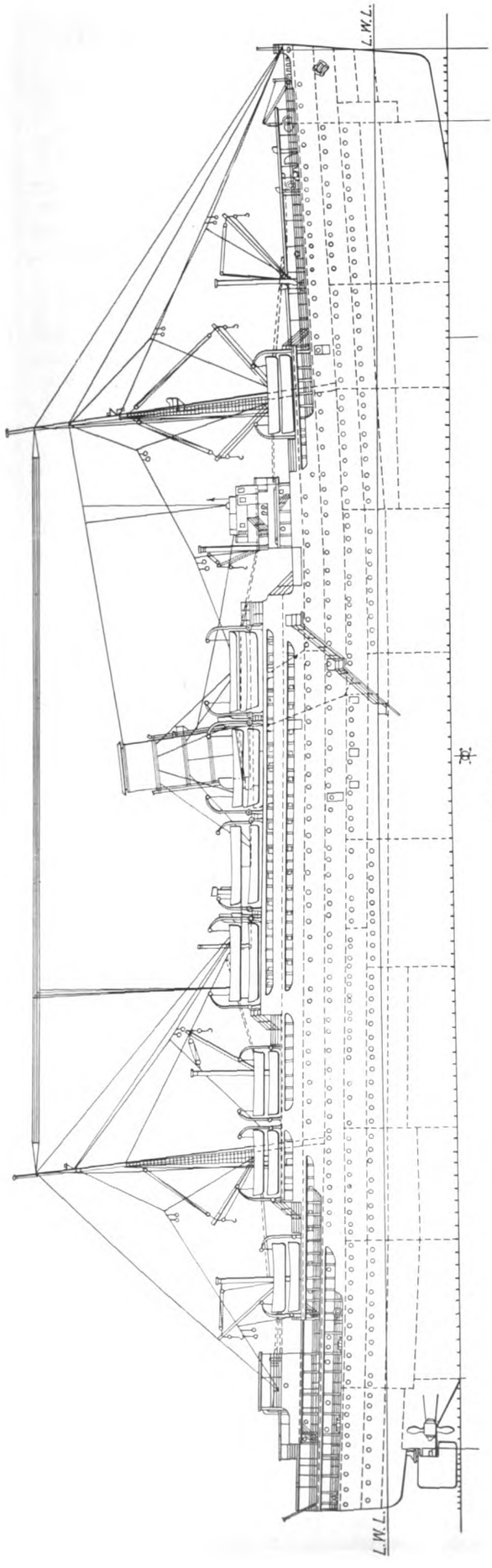

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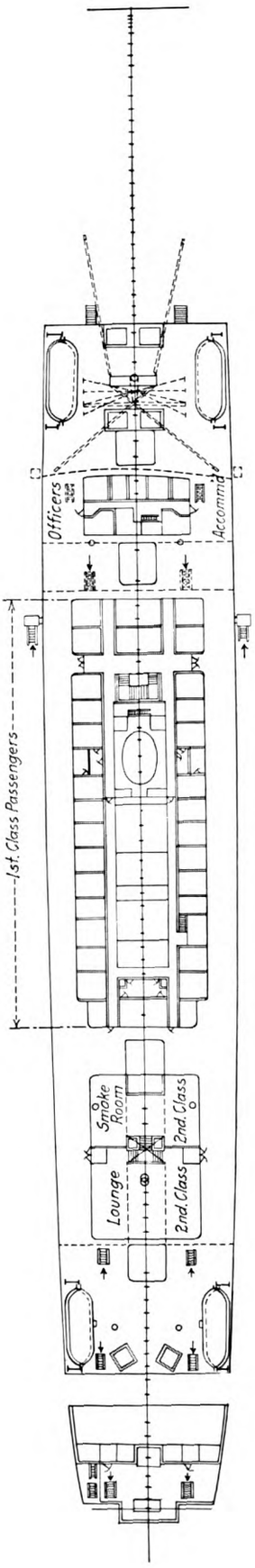
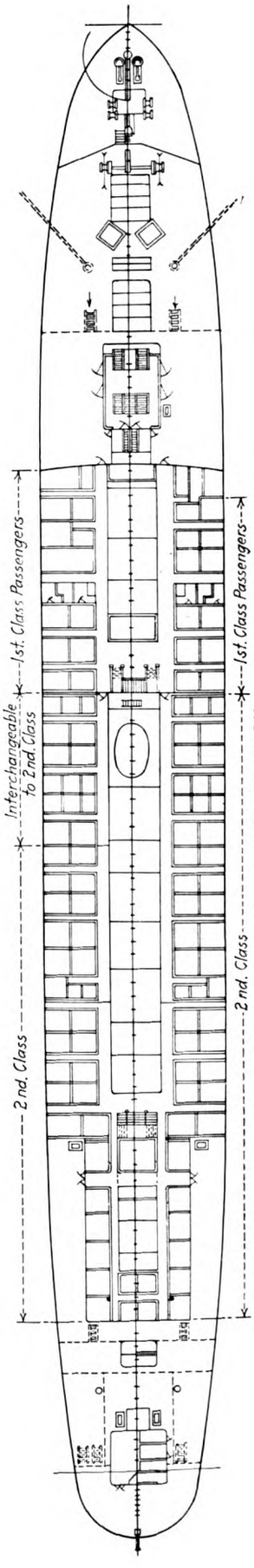


LOWER PROMENADE DECK



BRIDGE DECK

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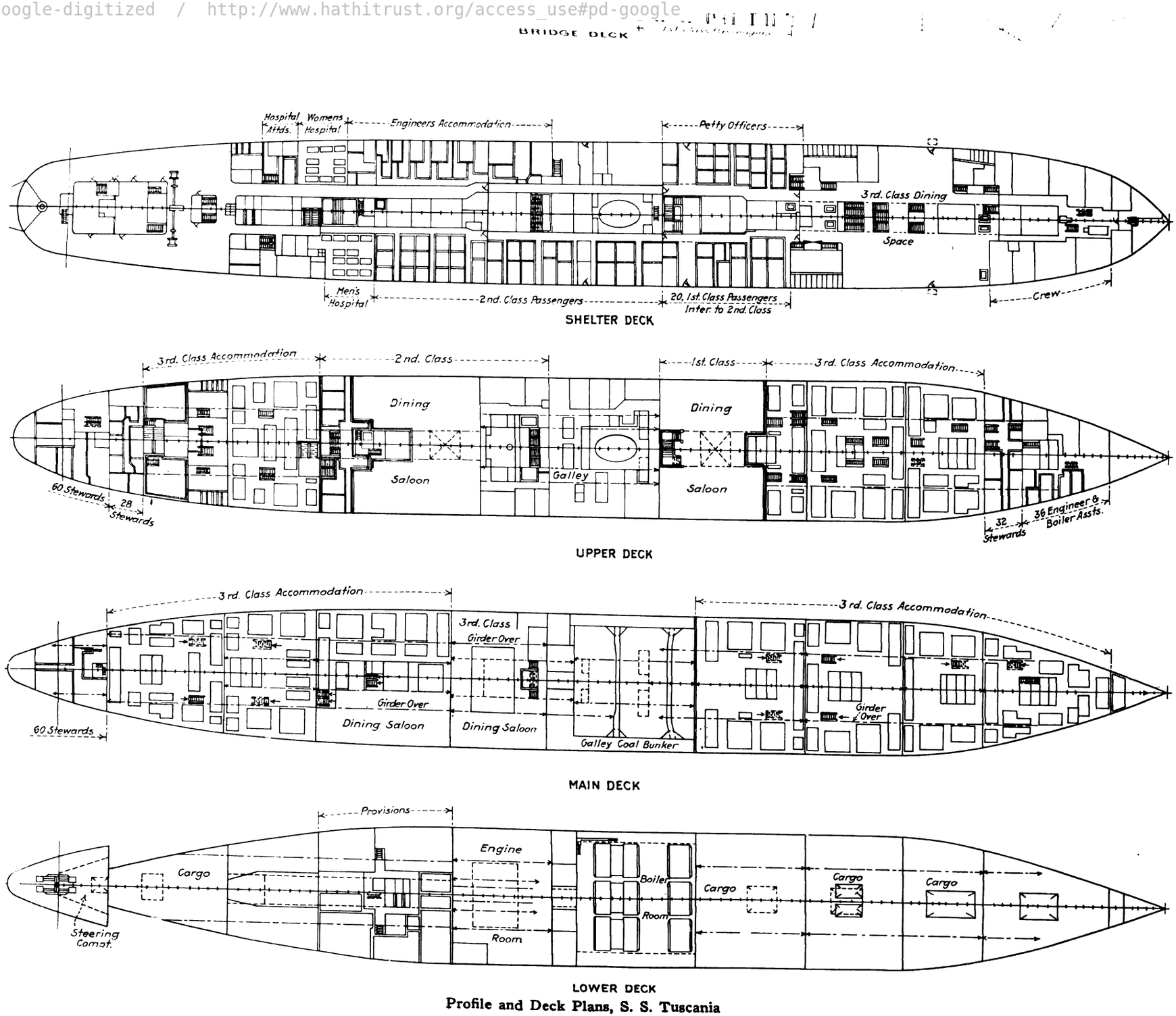

Profile and Deck Plans, S. S. Tuscania

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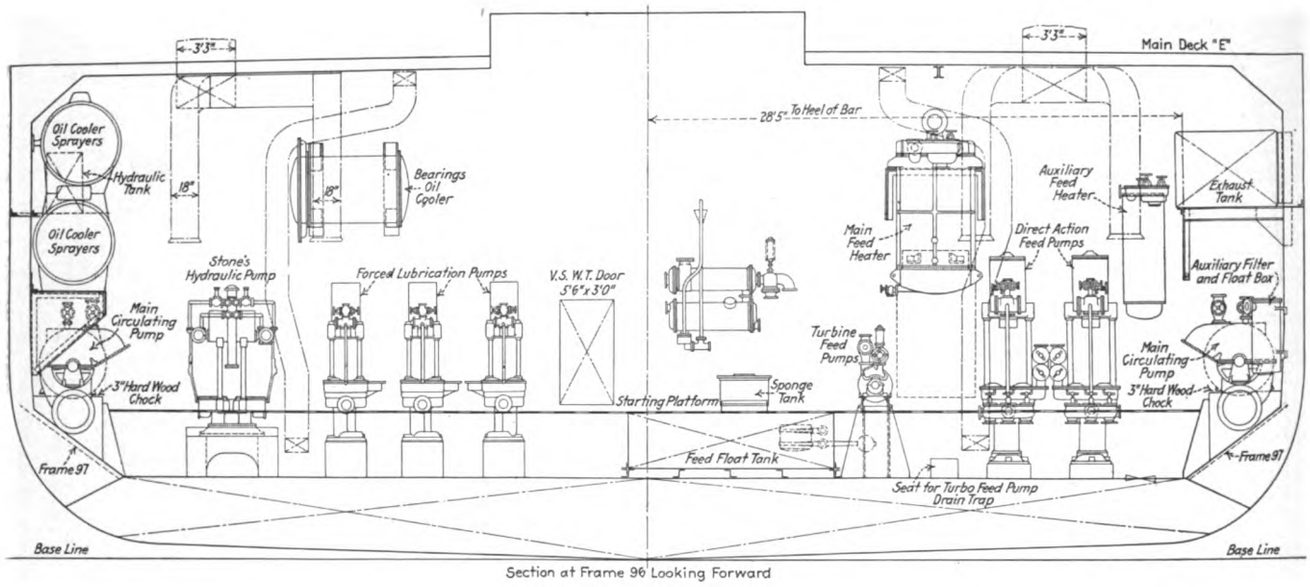
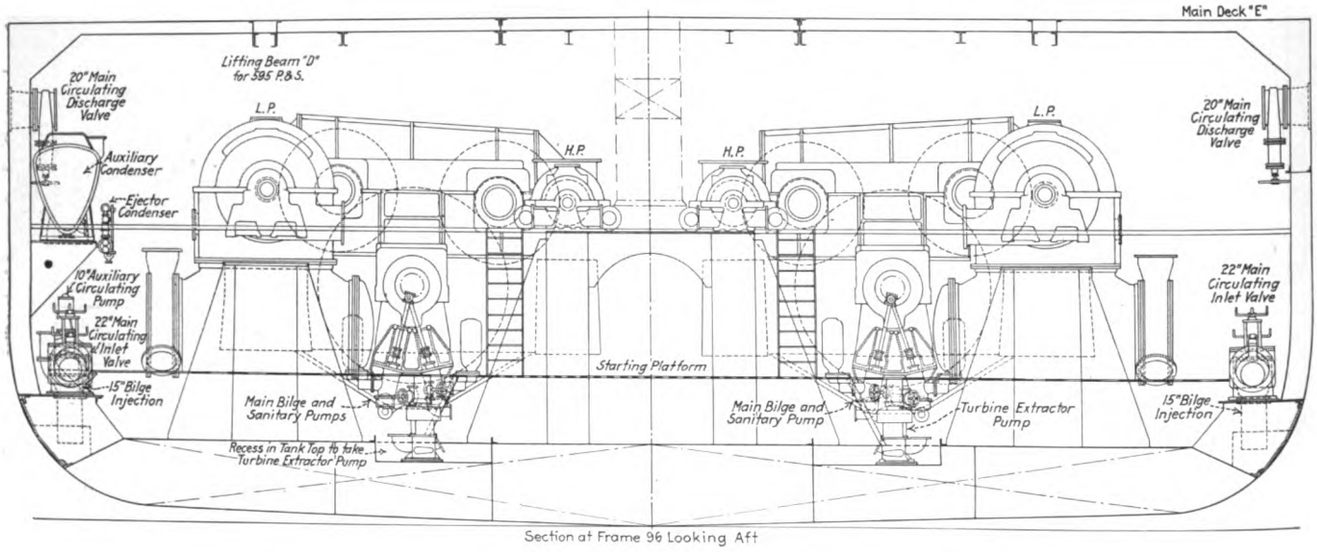
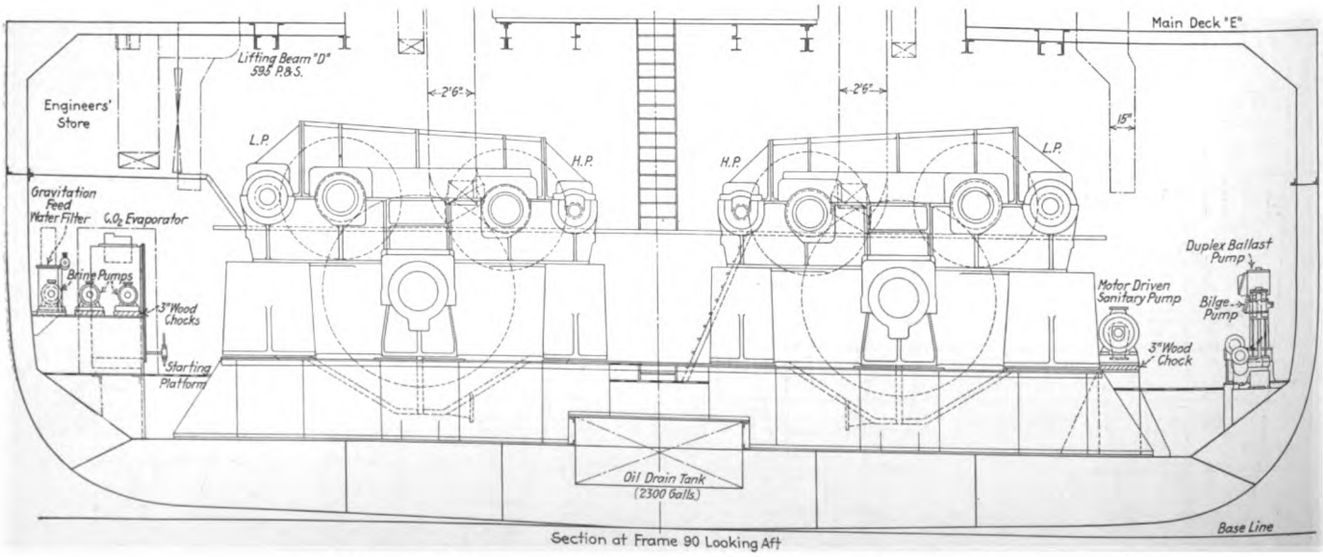


Section at Frame 96 Looking Forward



Section at Frame 96 Looking Aft



Section at Frame 90 Looking Aft

Transverse Sections Through Engine Room, S. S. Tuscania

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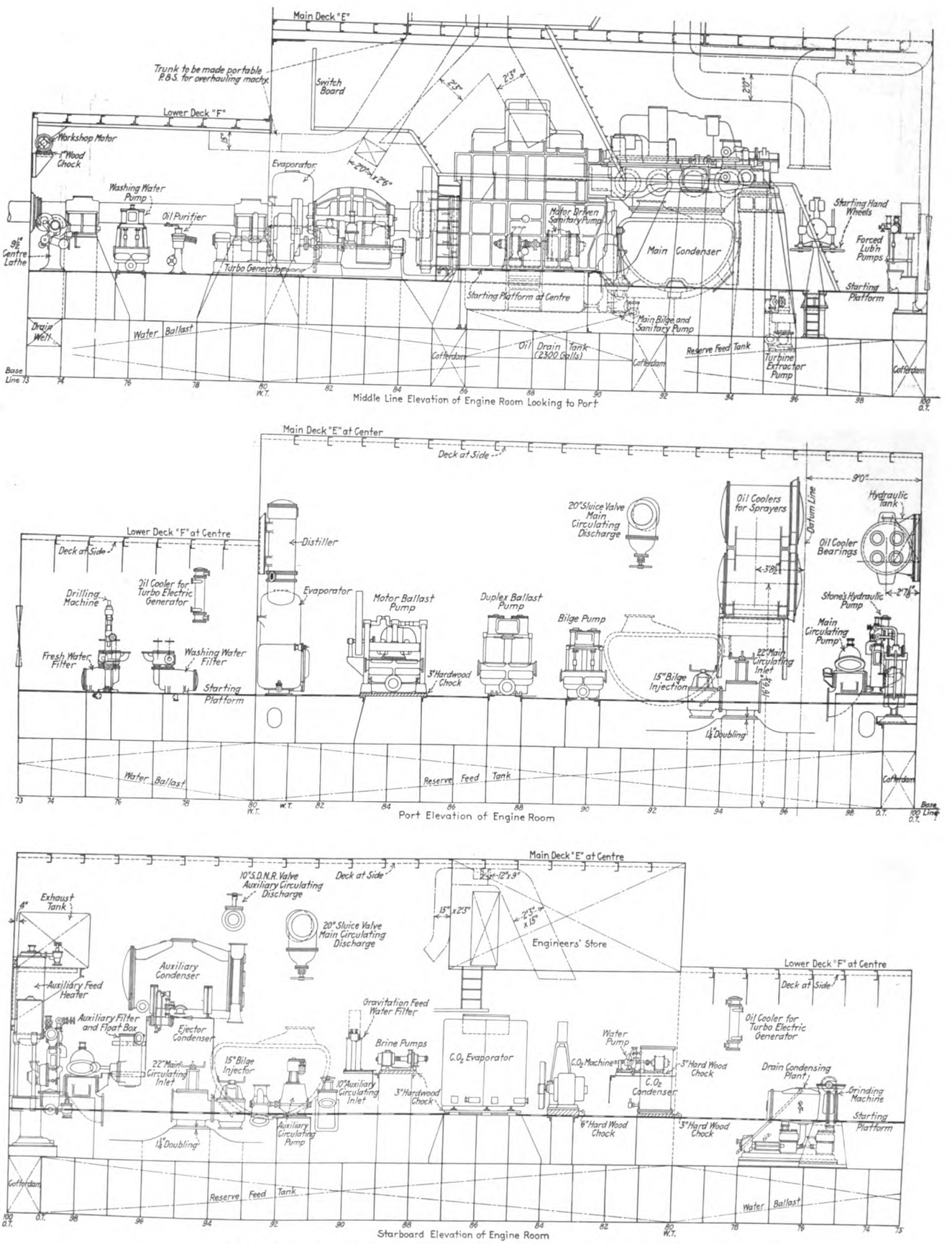

Longitudinal Sections Through Engine Room, S. S. Tuscania

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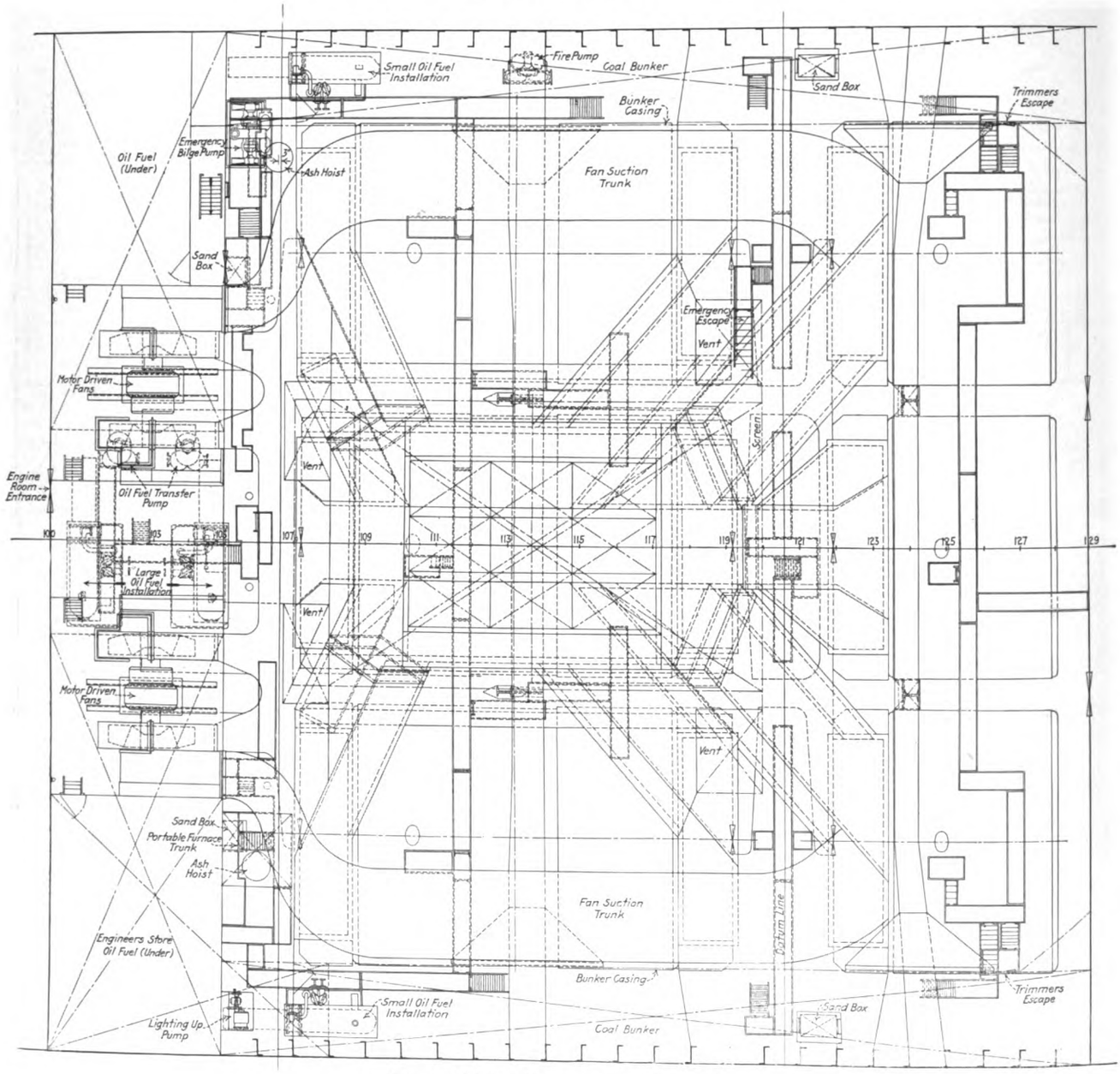

Plan of Boiler Room, S. S. Tuscania

two to fourteen people. The lounge and smoking room is situated in a deck house on the lower promenade deck with the main second class stairway between them. These rooms are furnished with comfortable chairs, sofas and settees. A piano is placed in the lounge and a bar arranged in the smoking room.

Third Class Accommodations

The third class passengers are berthed in open berths on the upper and main decks. Dining spaces are arranged on the main deck amidships and on the shelter deck forward. Smoking rooms and sitting rooms are provided on the upper and shelter decks aft.

Ample open and covered promenading spaces have been allotted to each class of passengers.

Careful attention has been given to the accommodation for the officers and crew of the vessel. The captain's rooms are on the bridge, officers on the lower promenade deck, engineers, petty officers and seamen on the shelter deck, firemen and stewards on the upper and main decks. Separate mess and recreation rooms have been provided for seamen, firemen and stewards.

The culinary department for the passengers and crew are replete with all the necessary equipment and fittings. The passengers' galley is placed on the upper deck between the first and second class dining saloons and the crew's galley is forward on the shelter deck.

The lifesaving equipment is sufficient to meet the requirements of all on board and is in accordance with the provisions of the International Convention on Safety of Life at Sea. The boats are placed under fourteen sets of davits of the "Welin" type.

Heating and Ventilation

The sanitary arrangements are of the most modern description and four distinct water services are provided. The first and second class accommodation, officers and petty officers rooms are heated by steam radiators while the third class and crew's quarters are heated and ventilated by the thermotank system.

Deck Machinery

As the vessel has a large cargo carrying capacity special attention has been paid to the appliances for rapidly handling

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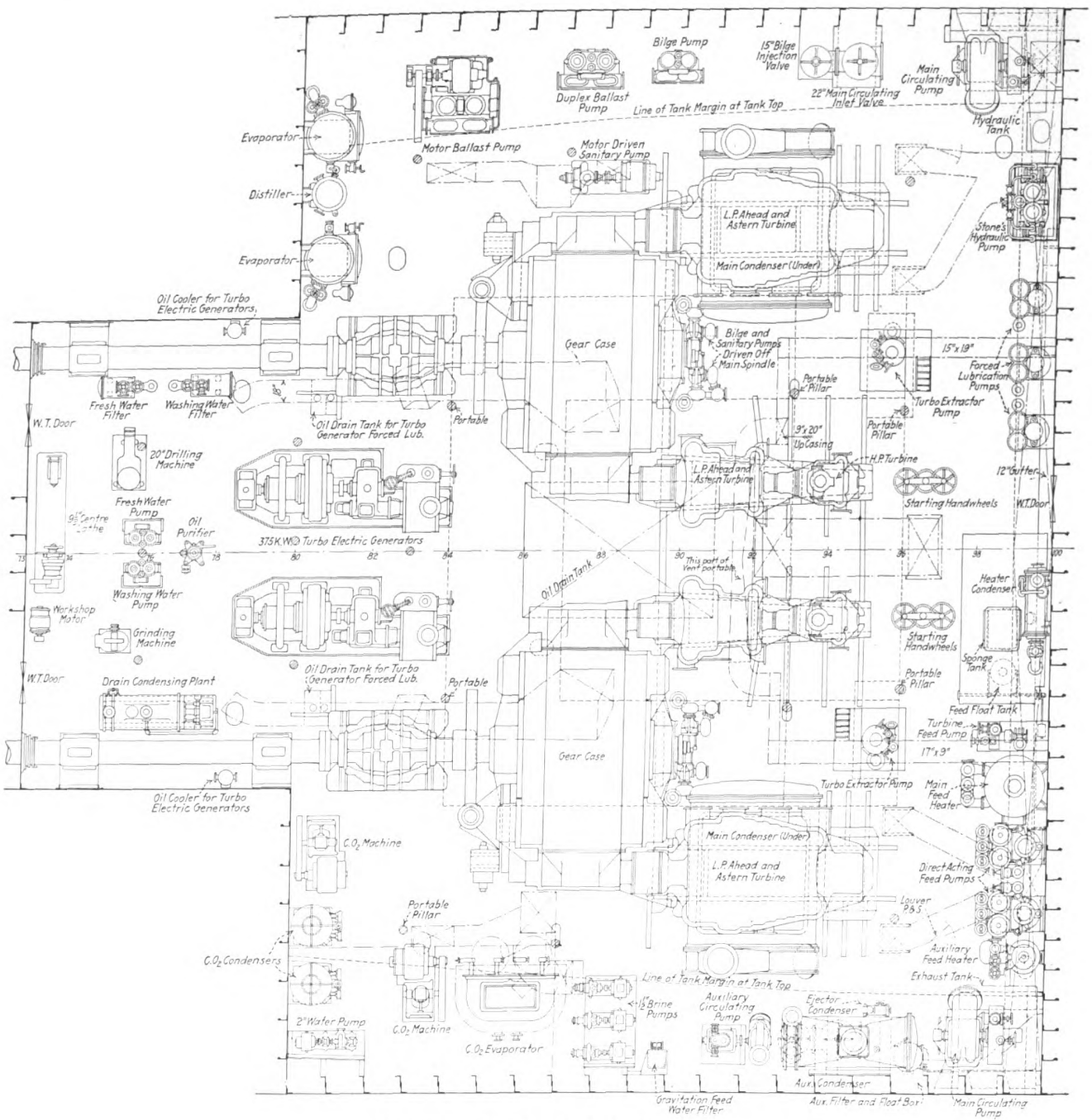

Plan of Engine Room, S. S. Tuscania

the cargo. Fourteen derricks are fitted each capable of supporting five tons; these are operated by means of electro-hydraulic winches.

All the deck machinery, including the windlass, is electrically operated. The steering gear, which is placed on the lower deck, is of the Hele-Shaw type, operated by telemotor gear from the navigating bridge.

Electrical Plant

A complete electrical installation is fitted throughout the ship. The generators consist of three sets of engines coupled to three dynamos, each of which is capable of giving an output of 100 kilowatts at 110 volts. In addition to these an emergency dynamo and engine is fitted in a deckhouse on the bridge deck.

A patent fire extinguishing system is fitted throughout the ship.

Insulated and other stores are placed aft on the lower deck. The refrigerating machinery for the insulated stores is of the CO_2 type and is placed in the engine room.

A wireless installation is installed to meet the requirements of the Italian Laws.

The deck covering throughout all accommodation is of Teakoid and in all lavatories and galleys Terrazzo tiling. Weather decks, where exposed, are laid with pitch pine.

Propelling Machinery

The propelling machinery consists of two sets of Brown-Curtis turbines, driving twin screws through double reduction gearing. Each set comprises three turbines, a high pressure and an intermediate pressure turbine being coupled together in tandem driving one first reduction pinion of the gearing, and a low pressure turbine driving the other first reduction pinion. A high pressure astern turbine is incor-

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porated in the same casing as the intermediate pressure ahead turbine, and a low pressure astern turbine is incorporated in the same casing as the low pressure ahead turbine.

BOILERS

Steam is generated in 3 double ended and 3 single ended boilers of the cylindrical return tube type, installed in one boiler compartment and designed for a working pressure of 220 pounds per square inch, superheaters being fitted capable of superheating the steam 200 degrees at the turbines. There is a complete installation, in duplicate, for burning oil fuel on the Howden-Wallsend system and provision is made for readily converting the boilers to coal burning if so desired at a later date.

AUXILIARIES

In place of the usual air pumps, etc., for maintaining the vacuum and dealing with the feed water, Weir's patent "closed feed" system will be fitted, rotary water extractor pumps and air ejectors taking the place of the air pumps.

A special condensing plant is fitted in connection with the ship's heating system to ensure a perfect control of the temperature in the accommodations, while the more important of the auxiliary engines in the engine room, such as sanitary and ballast pumps, are fitted in duplicate, one of each being arranged for steam and one for electric power drive.

S. S. Steelore Launched at Sparrows Point Shipyard

THE S. S. *Steelore,* a 20,500-ton turbine driven freight vessel, was launched at the Sparrows Point Plant of the Bethlehem Shipbuilding Corporation, Ltd., on August 15. She is owned by the Ore Steamship Corporation of New York, being the last of three vessels of this capacity and same general type to be built for this company recently at Sparrows Point.

The *Steelore* is arranged for carrying iron ore and when completed will be put into service for the transportation of ore from South America to the United States. She is of the same size and similar in construction to the *Bethore,* the large combination ore-and-oil vessel recently delivered at Sparrows Point to the Ore Steamship Corporation, but will be propelled by two Curtis-type turbines with Falk single reduction gears instead of by reciprocating engines.

The principal particulars of the *Steelore* are as follows:

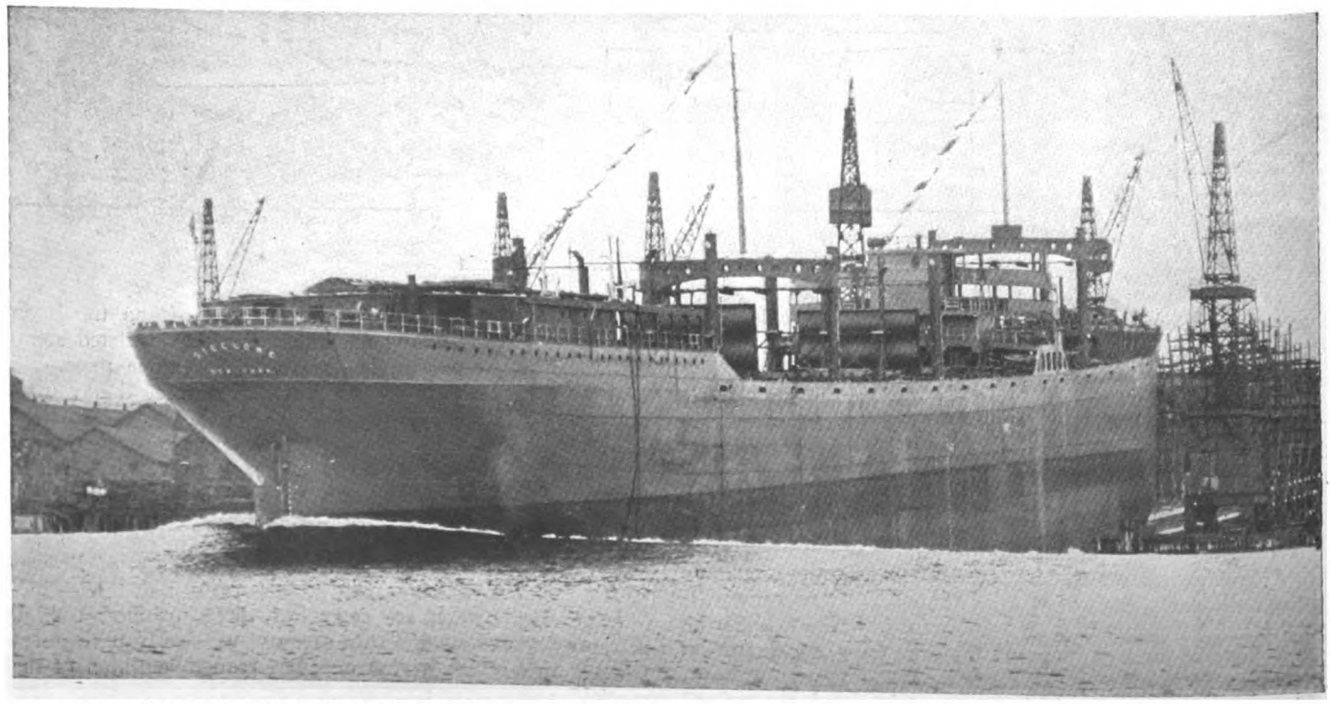
Length, overall	571 feet 6 inches
Length, between perpendiculars	550 feet 1 inch
Breadth, molded	72 feet
Depth, molded	44 feet
Draft, loaded	32 feet 4 inches
Deadweight capacity	20,500 tons
Speed	11½ knots
Turbines	Curtis with single reduction gear
Type of boilers	Single end, Scotch
Number of boilers	3
Size of boilers	17 feet 6 inch diameter by 12 feet long
Kind of fuel	Oil
Type of oil burning equipment	Bethlehem (Dahl)

Japanese Electrically Propelled Naval Vessel Has Successful Sea Trials

THE *Kamoi,* a 20,000-ton, 8,000 horsepower twin screw fuel ship of the Imperial Japanese Navy, and the first vessel of any navy other than the United States to be electrically propelled, successfully completed the builders' trials off the Delaware Capes on September 8. For thirty-six hours the *Kamoi,* manned by a crew from the yard of her builders, the New York Shipbuilding Corporation, and a Japanese crew under command of Captain T. Murase who will later take her over, was put through tests that brought into play every possible stress on all parts of her machinery and equipment and showed no signs of weakness.

FIRST INSTALLATION OF SYNCHRONOUS MOTORS ON TWIN SCREW VESSEL

The electric drive equipment of the vessel, designed and installed by the General Electric Company, includes the use of synchronous motors for the first time in any twin screw vessel. Tests demonstrated that the Japanese ship is the most economically operated steam vessel of her size afloat. Her electrical propelling machinery gives unusual flexibility of control as well as economy of operation, and the mechan-



Launching of S. S. Steelore at Sparrows Point Plant of Bethlehem Shipbuilding Corporation, Ltd.

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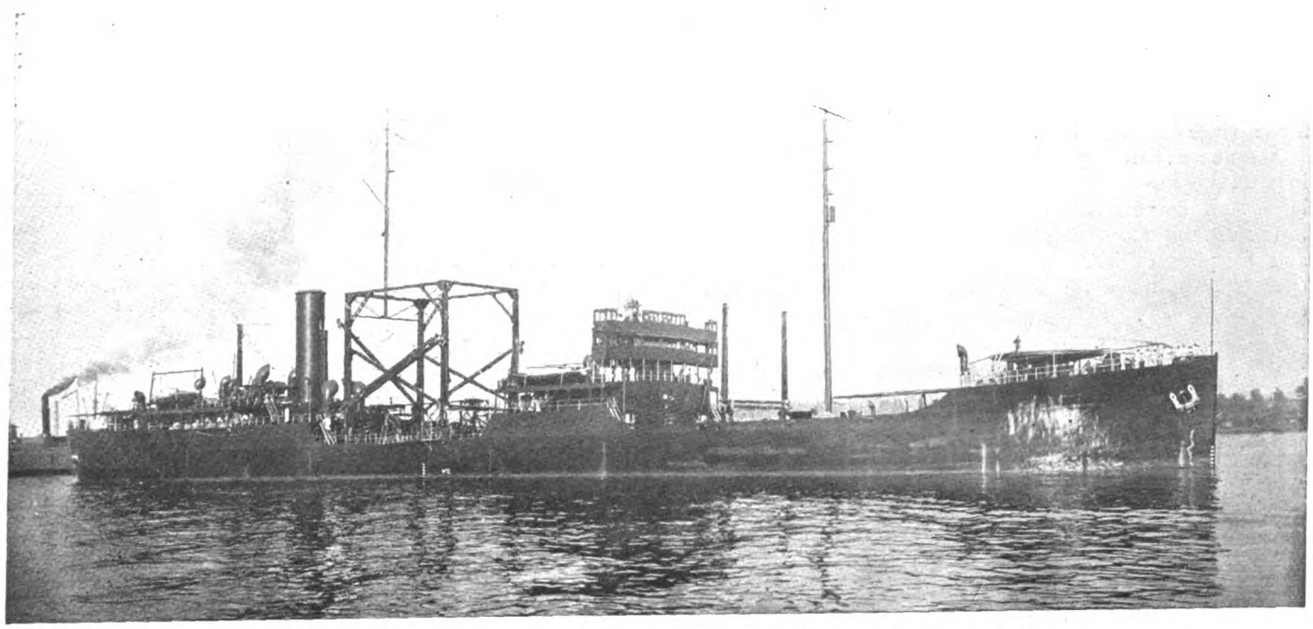

Japanese Fuel Ship Kamoi Leaving the Builder's Yard for Her Sea Trials

ical simplicity of the driving unit affords exceptional reliability.

There is practically no vibration to the vessel as was shown by the balancing of a nickel on edge on the foundation of the main turbine while the ship was under way. While the ship was going ahead at full speed the propelling machinery was reversed to ¼ speed astern in 19 seconds, after which the engines were brought up to full speed astern.

The *Kamoi* was built in this country instead of in the large shipbuilding yards of Japan in order that the Japanese might get electric drive which has been so highly developed in the United States on commercial and naval vessels.

Details of Machinery

The main propulsion unit consists of an 8,000 horsepower Curtis turbine generator, supplying power to two 4,000 horsepower synchronous motors directly driving the twin screw propellers. There are also two 400 kilowatt direct current turbine generators which supply the excitation current as well as power to operate the auxiliaries such as the main circulating pump, main condensate pump, sanitary pump, blower motors, steering gear, radio apparatus, ventilators and lighting equipment.

There is also a 625 kilowatt auxiliary alternator which can be connected to either of the auxiliary turbines in case of the failure of the main driving unit or any of the auxiliaries. This small generator will supply sufficient power to propel the ship at a speed of about seven knots.

The vessel is a coal burner, equipped with four Yarrow type boilers which have oil spray boosters attached to be used when high temperature is desired quickly.

Radio Equipment Is Unusual

The radio equipment is also of General Electric manufacture, consisting of a one kilowatt telephone and telegraph transmitter and two complete receiving sets, one with a range of 250 to 3,000 meters and the other from 250 to 30,000 meters. An unusual feature of the telephone installation is five extensions from the radio room connecting with the captain's cabin, engine room and other parts of the ship. By means of this equipment the captain can remove the receiver from the 'phone at any one of five stations and put in a call for the officer of another ship and carry on a conversation by radio much as he might from an office on a land telephone.

The ship has a normal tonnage of 19,500, is 495 feet long and has a beam of 62 feet. She has a draft of 28 feet and is equipped to carry approximately 10,000 tons of fuel oil.

Dock trials were held at Camden on August 25 and proved most satisfactory. After informal receptions on board the ship at Philadelphia and New York the *Kamoi* will proceed to Norfolk to take on fuel and will leave later on its trip to Japan.

Geared Turbine Cargo Steamer Built on the Wear for Dutch Owners

ONE of the latest vessels completed by The Wear Shipyard of William Gray and Company (1918) Limited, West Hartlepool and Sunderland, is the finely modeled geared turbine steamer *Modjokerto* built for Rotterdamsche Lloyd (William Ruys & Zonen, Directors, Rotterdam). The vessel was launched on February 27 of this year and successfully completed her sea trials on July 20.

The leading particulars of the vessel are as follows:

Length overall	451 feet	0	inches
Length on load waterline	449 feet	9	inches
Length between perpendiculars	433 feet	0	inches
Breadth, extreme	57 feet	3	inches
Breadth, molded	57 feet	0	inches
Depth, molded (to upper deck)	32 feet	10	inches
Depth to shelter deck	41 feet	0	inches
Load draft	29 feet	10¾	inches
Load displacement	16,436 tons		
Load displacement coefficient	0.783		
Tons per inch at load waterline	51.55		
Deadweight tonnage (cargo and bunkers)	11,416		
Under deck tonnage	6,181		
Gross tonnage	8,404		
Net tonnage	5,350		

The vessel is of the shelter deck type without tonnage opening, and has been built under special survey to take the highest class of Lloyd's Register of Shipping. The Dutch Board of Trade Laws have also been complied with.

Although the vessel is built on the usual double bottom construction, several of the double bottom tanks have been specially constructed for the carriage of oil fuel. Heating coils have been fitted around the suction pipes in these

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tanks to liquefy heavy oil. A deep tank of over 1,000 tons capacity is arranged directly abaft the engine room for the carriage of cocoanut oil, and a deep tank of similar capacity is provided immediately forward of the boiler room for the carriage of oil fuel. Side bunkers are also arranged for the carriage of oil fuel.

Accommodation is provided for the officers and engineers in steel houses built abreast the machinery casing, and a large steel house is arranged abaft No. 2 hatch, in which is the dining saloon and 5 staterooms. The captain's day and sleeping cabins, the wireless room and the wireless operator's cabin are situated over the dining saloon, and the chart house is fitted on top of the captain's house.

For the rapid handling of cargo, 14 steam winches by Messrs. Clarke, Chapman & Company, Ltd., Gateshead, are provided to work 14 derricks. A heavy derrick to lift 30 tons is stepped on the shelter deck directly abaft the foremast, and provision is also made directly forward of the mainmast for the transposing of this derrick.

The windlass is arranged to take a 2⅜ inch cable, and is of a very powerful type, the makers being Messrs Clarke, Chapman & Company, Ltd. The steering gear is of the Wilson-Pirrie type by Messrs. Hastie & Company of Greenock, and is operated by telemotor from the bridge.

An up-to-date electrical installation has been fitted throughout the vessel by the builders. Current is supplied at 65 volts by two dynamos of 16½ kilowatts capacity each, located in the engine room. The engine room auxiliaries are supplied by the Central Marine Engine Works.

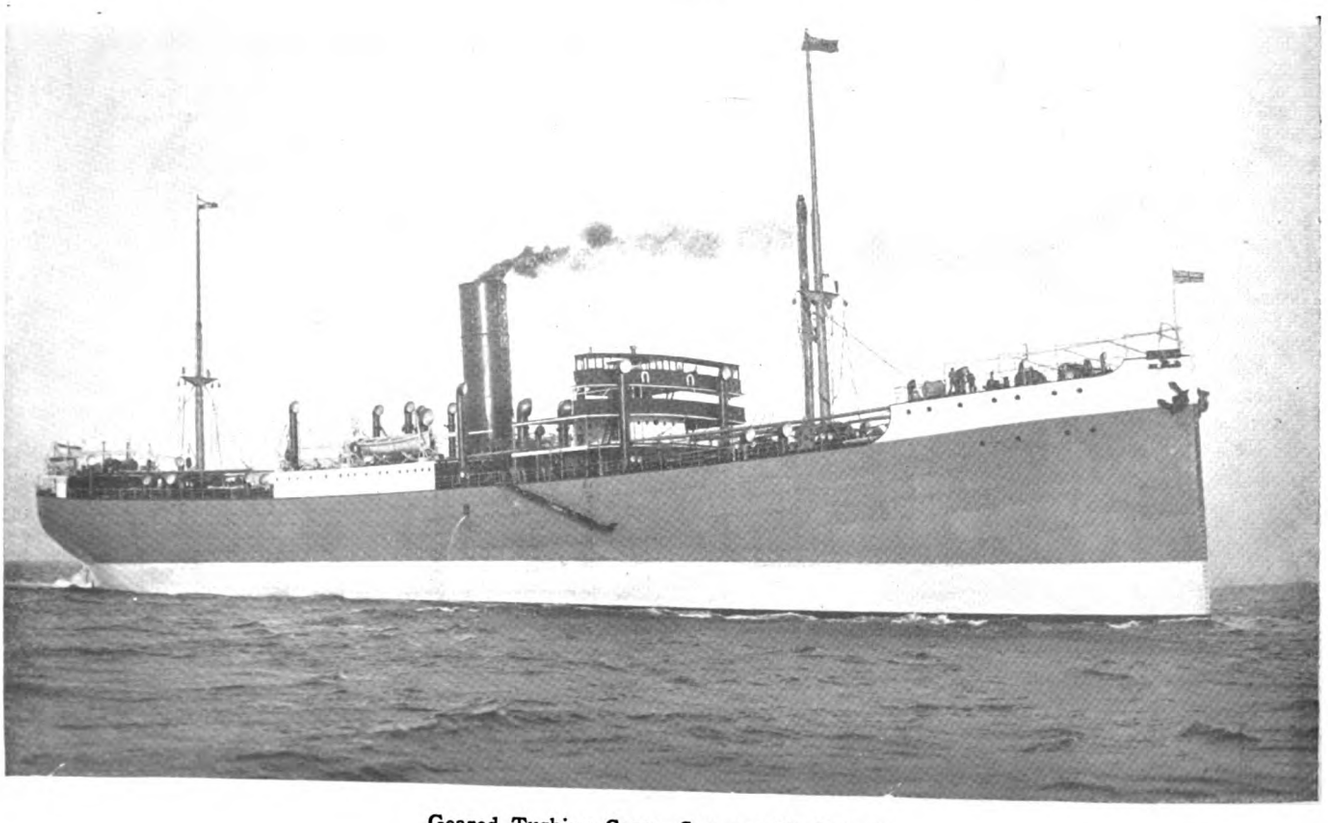
The propelling machinery, supplied by the Central Marine Engine Works, West Hartlepool, consists of one high pressure turbine of the impulse type, and one low pressure turbine of the reaction type, independently connected through flexible couplings to a set of double reduction gear wheels, which drive a four-bladed bronze propeller through a single line of shafting. Astern turbines, capable of developing 70 percent of the ahead power, are contained in the casings of the two ahead turbines.

Steam is supplied by four multitubular boilers, working under Howden's system of forced draft at a pressure of 225 pounds per square inch, and having a superheat of about 100 degrees F. The boilers are specially designed for burning coal or oil fuel.

Wrought Iron Produced by Mechanical Methods

BECAUSE of its desirable corrosion-resisting properties and resistance to vibratory stresses, wrought iron has always been in great demand industrially, its use being limited only by the output. The excessive labor and cost of hand puddling has largely been responsible for this condition, to overcome which many types of mechanical puddling furnaces have been designed at various times. The latest development in this connection is an oil-fired electrically operated furnace, which, working in conjunction with a new Titan rotary squeezer makes up the Titan process of wrought iron production, as carried out by the Titan Iron and Steel Company, Inc., Newark, N. J.

Physical, chemical and microscopic laboratory tests of wrought iron worked by this process indicate that all the desirable properties of hand-puddled wrought iron are retained and that the uniformity of structure is increased. In addition, the distribution of slag contained is more uniform, thus insuring maximum protection against rust and corrosion. Metallurgically, the Titan mechanical process of puddling is practically the same as the old hand process; that is, the stages of clearing, boiling, dropping and balling are carried on in a similar manner in both processes. The new type squeezer makes possible the removal of the correct amount of excess slag from the larger mass of wrought iron produced in the mechanical puddle furnace in one heat. Oil firing is an advantage in the process as well and makes possible quantity production of the metal on an economical basis.



Geared Turbine Cargo Steamer Modjokerto

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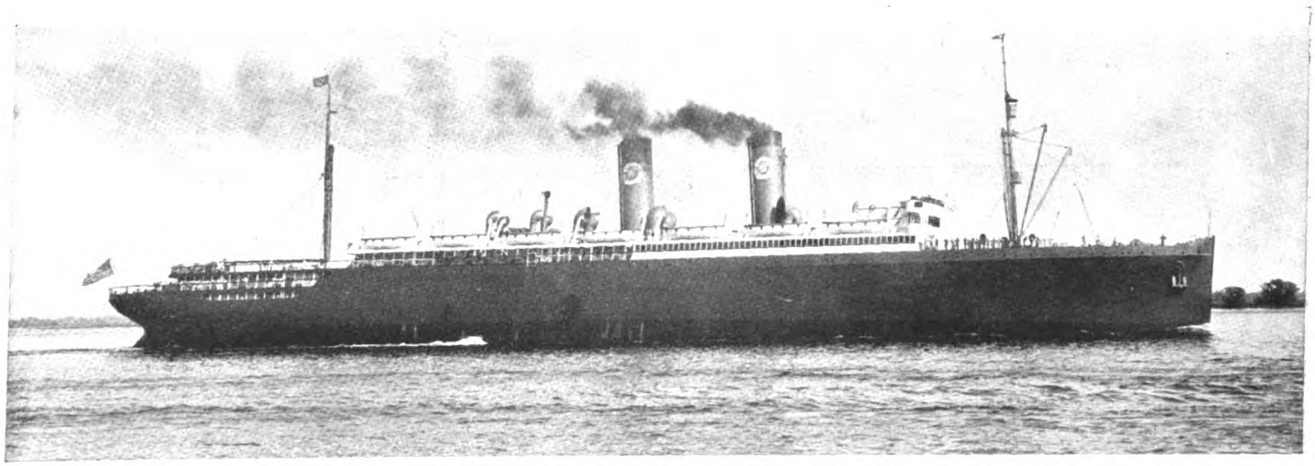

Reconditioned Steamship H. F. Alexander Leaving the Sun Shipyard

Passenger Accommodations of the H. F. Alexander

U. S. S. Columbia, Formerly Army Transport Great Northern, Reconditioned at Sun Shipyard for Admiral Line Passenger Service

FEW vessels in the American merchant marine have had a more varied or interesting career than has fallen to the lot of the 23-knot, triple screw passenger steamship *Great Northern,* which, with her sister ship, the ill-fated *Northern Pacific,* was built eight years ago by the William Cramp and Sons Ship and Engine Building Company, Philadelphia, Pa., for the San Francisco-Astoria service of the Spokane, Portland and Seattle Railway Company, a subsidiary of the Great Northern Railway Lines. She is the largest direct turbine-driven passenger vessel built in the United States and with the graceful lines of her hull, ample freeboard and well-protected decks provides the qualities of speed, strength and seaworthiness so desirable for the fast coastwise service for which she was originally designed.

With the entrance of the United States into the World War the *Great Northern* was called into service as an army transport and carried upwards of 35,000 men to the battlefields of Europe, making round trips in a fraction over twelve days. After the war the vessel was again in service in Pacific waters for a brief period after which she was taken over by the Navy, rechristened the *Columbia* and used as the flagship of the Atlantic fleet. On March 2 of this year the *Columbia* was brought to the yard of the Sun Shipbuilding Company at Chester, Pa., by the Admiral Line to be reconditioned as a first-class passenger liner for the coastwise service of her new owners between Seattle, Wash., and San Pedro, Cal.

Within ten weeks the transformation of the vessel was complete, the work involving the complete rebuilding of her four principal decks. Two hundred and fifty-four staterooms were built, with their fittings, together with about fifty special de luxe suites, officers' quarters, dining room, lounge, new heating and ventilating systems and many other changes. Some idea of the nature of this work can be gained by an inspection of the interior views of the *H. F. Alexander,* as the vessel is now named in honor of the president of the Admiral Line, which are reproduced on the following pages through the courtesy extended by the Sun Shipbuilding Company.

Plans for reconditioning the vessel were furnished by Theodore E. Ferris, naval architect, New York, who personally supervised the work. On the "A" or promenade deck, which is flush from the stem to a point near the stern, are the main public rooms including the lounge, observation room, music room, main lobby, smoking room and deck veranda. On the deck below is a woman's writing room while the main dining room, with galley, pantry, etc., is located on the upper deck. The style of decoration and furnishing in the public rooms is varied and pleasing, each being especially adapted for its purpose. In the lounge, smoking room and the owner's suite fireplaces form an attractive feature of the furnishings.

General Characteristics of Vessel

With her commodious and luxurious accommodations the *H. F. Alexander* offers the most modern facilities for swift transportation by water along the Pacific coast. The vessel has a length overall of 524 feet and between perpendiculars of 500 feet. Her beam is 63 feet and her depth to the promenade deck 50 feet 8 inches. She has a deadweight carrying capacity of 2,185 tons on a draft of 21 feet. Her gross tonnage is 8,255 tons. Propulsion is by Parsons turbines arranged on three shafts, the high pressure turbine driving the center shaft and the low pressure turbines the wing shafts. At her designed speed of 23 knots the propellers turn at 325 revolutions per minute. Steam is supplied at 220 pounds per square inch by 12 oil-fired Babcock and Wilcox watertube boilers working under the closed stoke hold system of forced draft.

Additional Repairs Required

Just after the *H. F. Alexander* had been turned over to the Admiral Line and was on her way to New York, preparatory to her sailing for her station on the Pacific coast, the vessel was in collision with the British steamer *Andree* causing extensive damage to her bow. Returning to the Sun yard on May 22 the ship was placed in drydock for repairs. The damage both above and below the waterline was so extensive that it was necessary to replace a considerable portion of the stem and main keelson and twenty-seven frames and plates. The work was rushed day and night without interruption and on May 29, two days ahead of the scheduled time, the job was completed and the vessel was ready to take on her fuel oil and resume her service.

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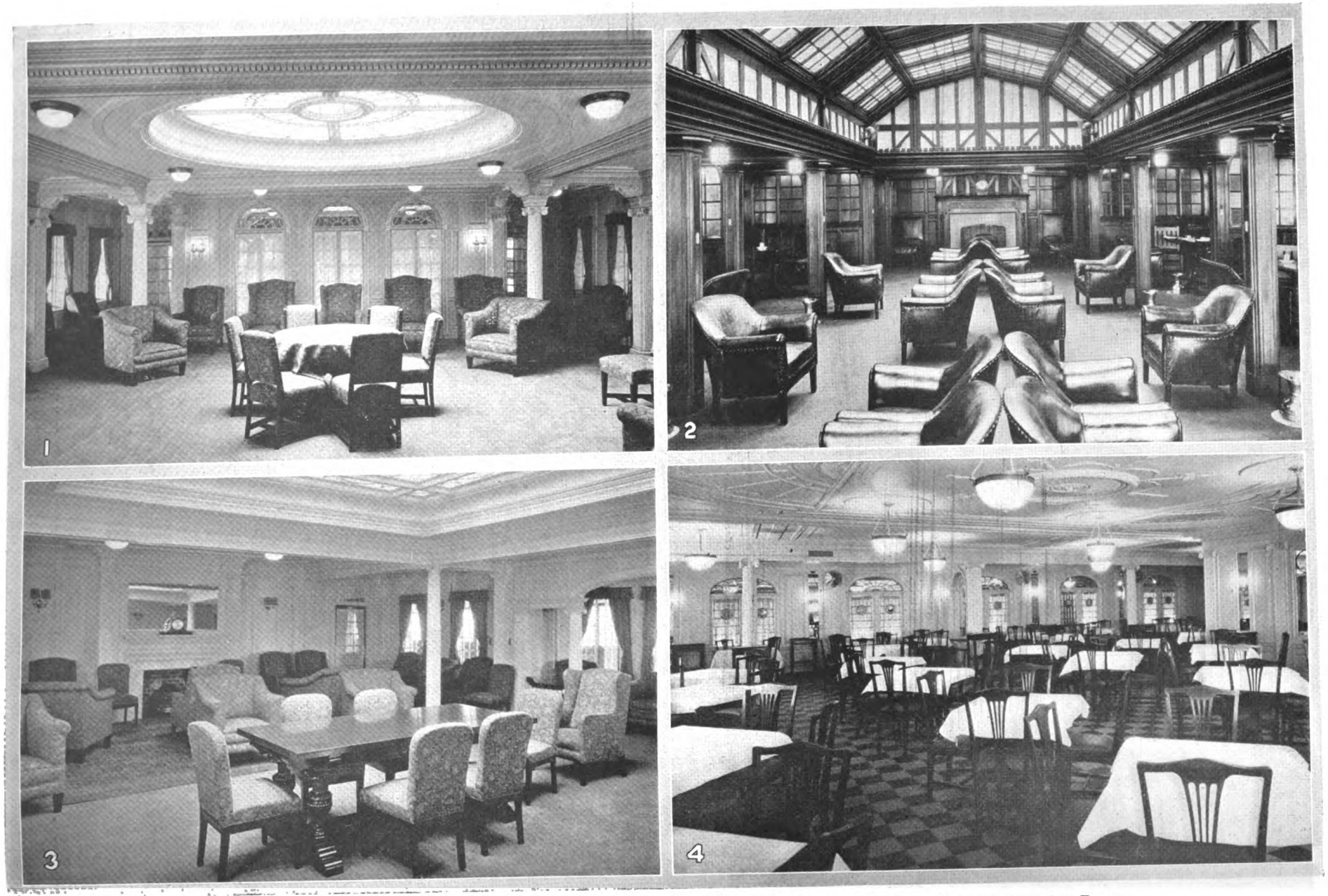

Interior Views of H. F. Alexander: (1) Observation Room, (2) Smoking Room, (3) Music Room, (4) Dining Room

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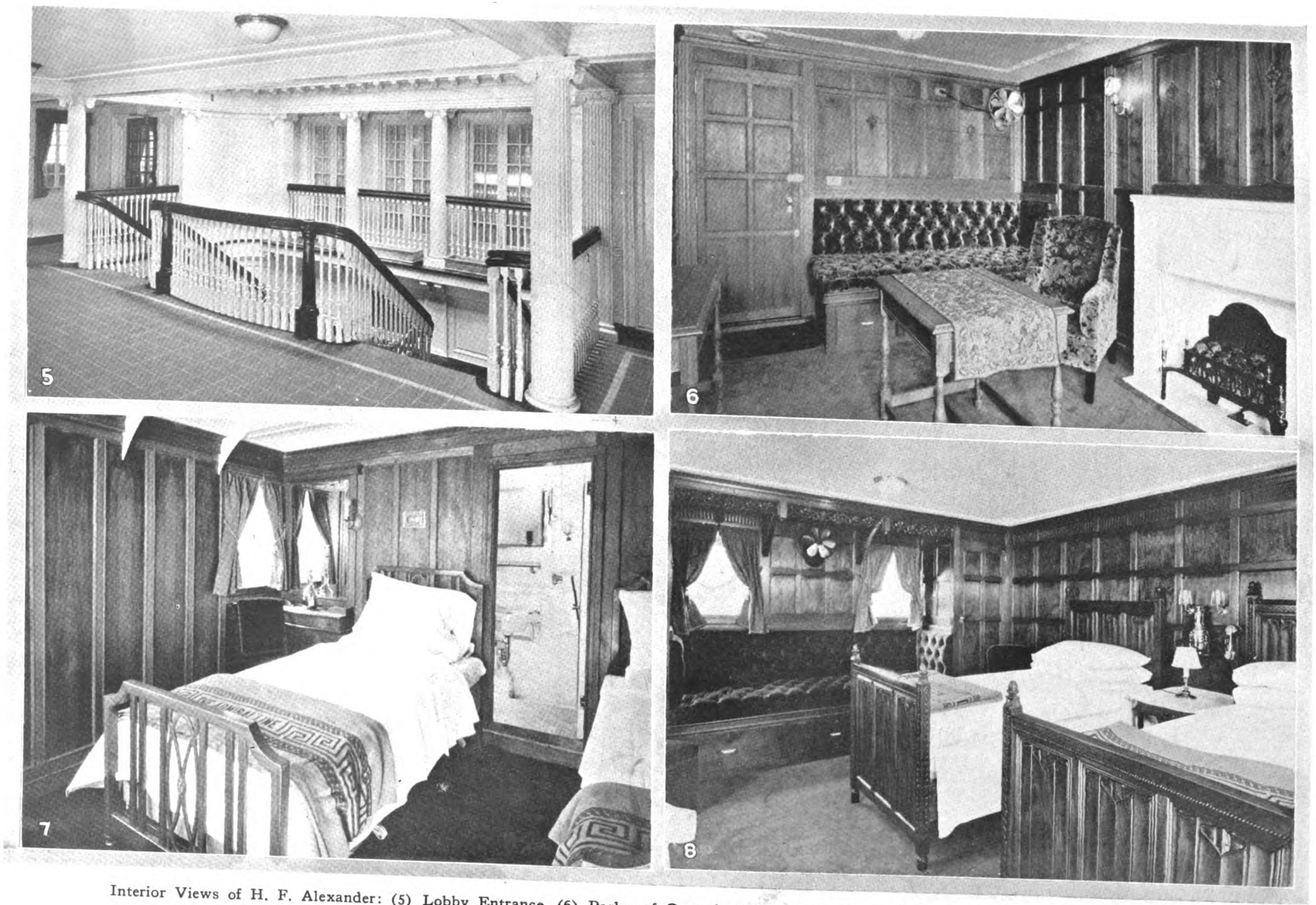

Interior Views of H. F. Alexander: (5) Lobby Entrance, (6) Parlor of Owner's Suite, (7) Stateroom de Luxe and Bath, (8) Owner's Bedroom

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The Golden Gate, Which Runs Between San Francisco and Sausalito in San Francisco Bay, Is the First Diesel Engine Electric Ferryboat to Go Into Operation

Electric Drive Adopted in a New Field

Application to Double Ended Ferryboats—Types of Installation, Power Requirements and Advantages Described

By W. H. Wild*

THE effective service rendered in recent years by electrically propelled vessels of many different types and sizes is one of the chief factors which has just led to the extension of the system into a new field—the double ended ferryboat. News dispatches have announced the placing of several orders for electric equipment for boats of this class in New York and San Francisco, and one of the vessels went into service in the harbor of the latter city this summer. There are now seven ferryboats either running or in process of building, utilizing both the Diesel engine and turbine electric method of propulsion. Three boats have been contracted for in New York with turbine electric drive and four in San Francisco equally divided between Diesel engine electric and turbine electric drive.

Intended for Fast Service

The San Francisco boats are intended for fast service across the Bay, being 220 feet long, overall, and equipped with two 500 horsepower Werkspoor Diesel engines, each driving a 360 kilowatt, 250 volt direct current generator. The power from the generators is delivered to two 750 horsepower, 500 volt shunt wound motors, one on each propeller shaft. The New York Harbor boats are much larger, and will run between Staten Island and New York City. Their propulsion equipment consists of one 2,200 shaft horsepower, 2,300 volt, 3 phase turbine generator supplying power to two 2100/100 shaft horsepower, 2,300 volt, 3 phase induction motors, one on each propeller shaft. Both types of boat are designed to give rapid service on runs about five miles in length.

The dominating idea behind the application of electric drive in both instances was to give rapid and efficient service with the greatest economy possible. The performance of various ocean going ships equipped with both classes of electric drive have demonstrated its superiority on a number of counts. Among the most important of these are reduced fuel consumption, better maintenance of the desired speed under varying conditions and increased maneuvering ability. All of these are of equal importance in the case of ferryboats, especially those operating on runs of considerable distance through crowded harbors where strong current may be encountered.

Tests conducted over the past twenty years on double

*Marine Department, General Electric Company, Schenectady, N. Y.

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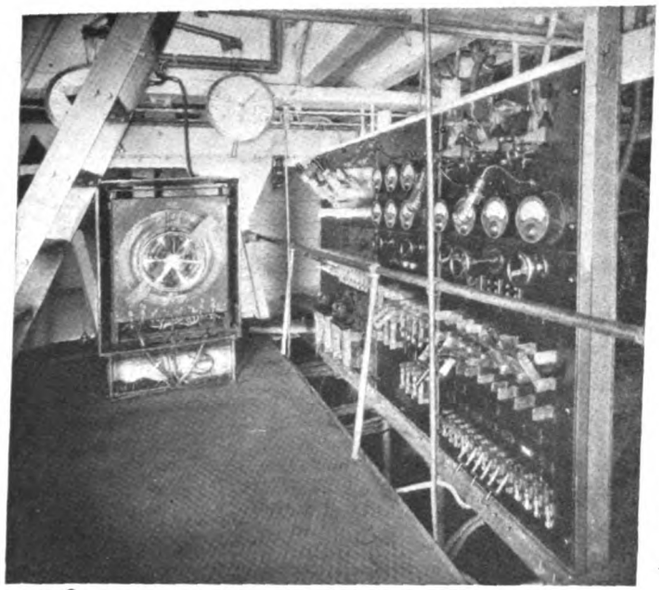
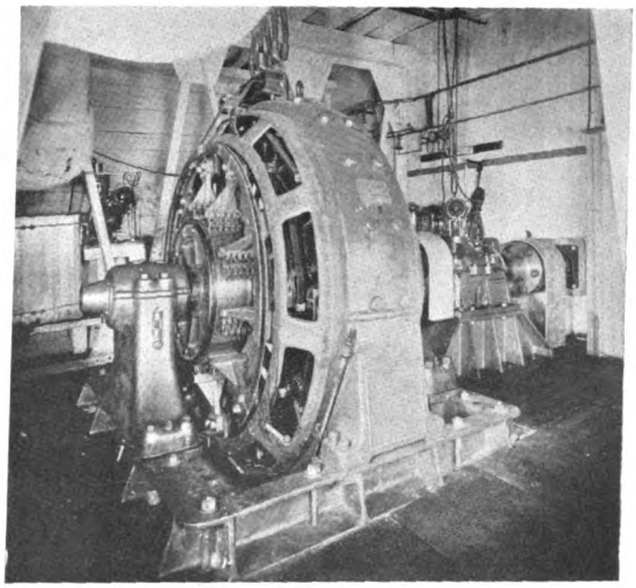


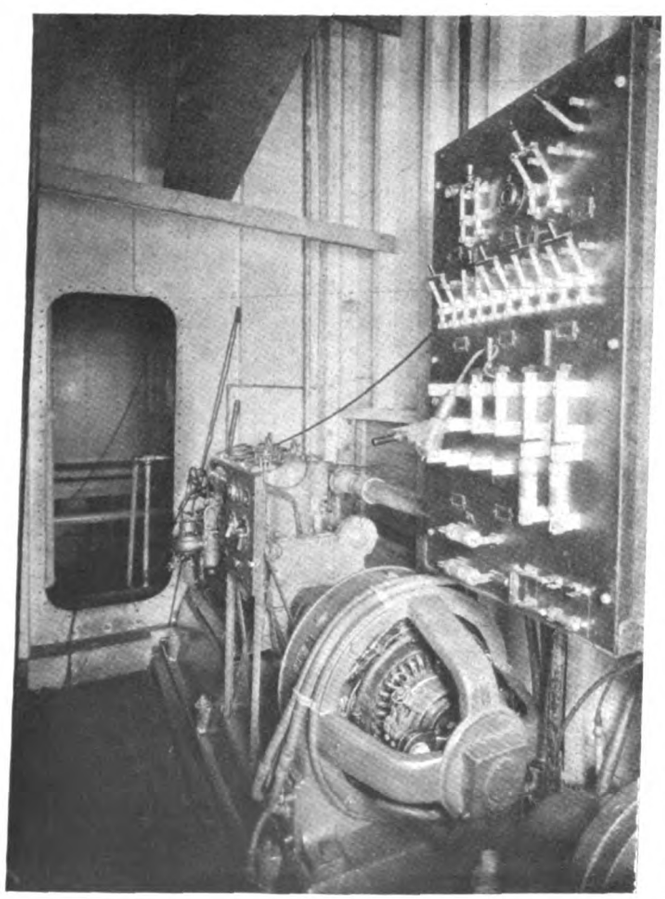
Switchboard Gallery in the Engine Room, Showing Control and Meter Panels and Control Rheostat, on the Golden Gate



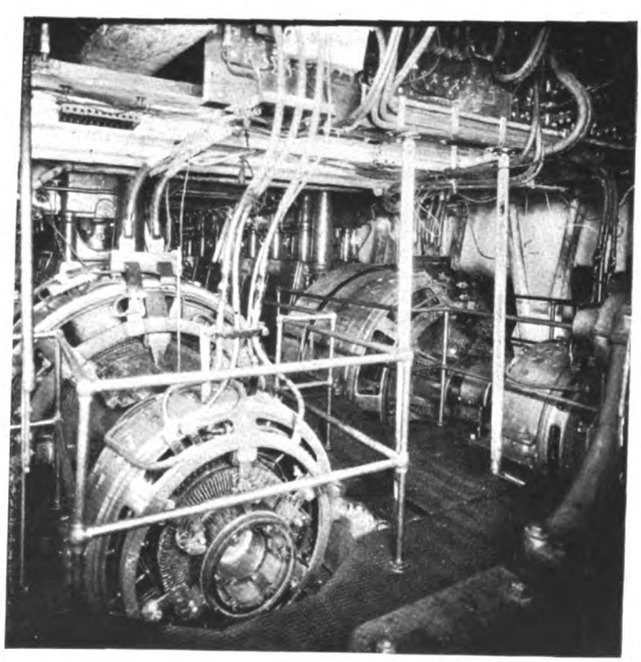
One of the Golden Gate's 750 Horsepower, 500 Volt, Shunt Wound, Direct Current Propeller Motors. Two of These Are Installed, One at Each End of the Engine Room

ended ferryboats have established two salient facts in connection with their design and operation. First they must have propellers fore and aft, both for maneuvering, and changing direction quickly, and second, the most efficient method of propulsion is by means of the stern propeller. Until the inception of electric drive, the problem of how to effect the concentration of power on the stern propeller remained without a really satisfactory solution. The basis for such a statement is the result of tests made on steam ferryboats, which showed high percentages of power loss, due to the bow propeller. As a result, in most cases the boats had to be "overpowered" considerably in order to insure the desired speed and maneuvering ability.

On the other hand, the flexibility of electric drive makes the solution of the power concentration problem comparatively simple. By using two motors, each individually con-



One of the Diesel Engine Driven Auxiliary Generators on the Golden Gate Which Supply Power for the Pumps, Current for Lighting, etc.



Engine Room of the Golden Gate, Showing the 500 Horsepower Werkspoor Diesel Engines and 360 Kilowatt, 250 Volt, Direct Current Generators and Exciters Which Supply Power to the Propelling Motors

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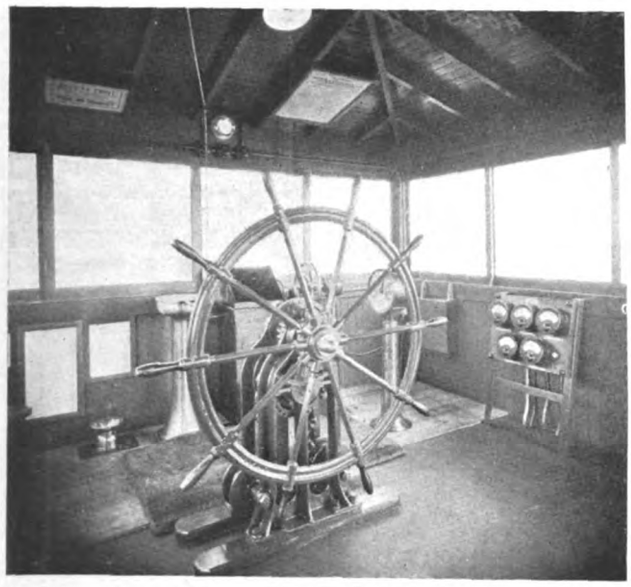
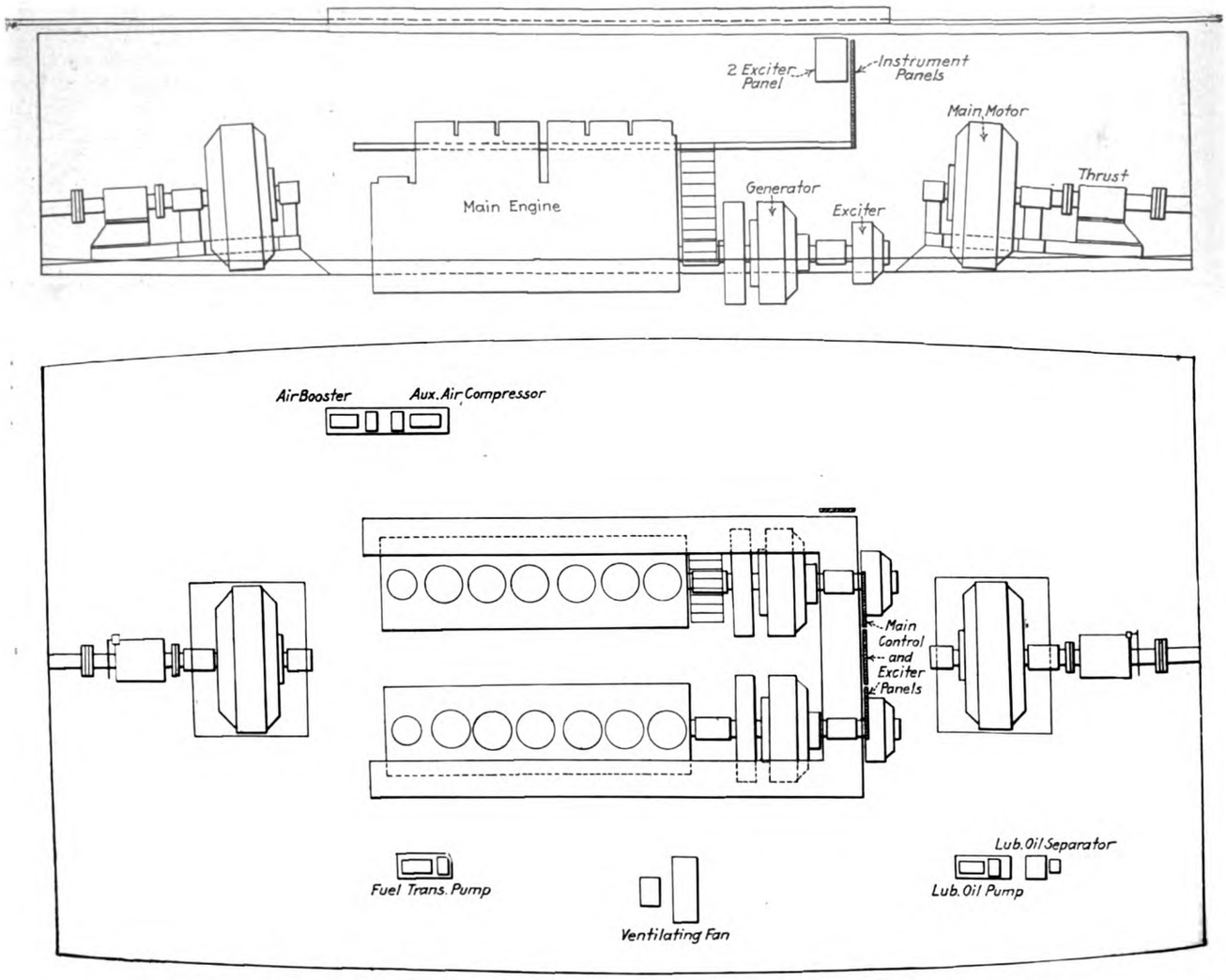


Interior of Pilot House of the Golden Gate, Showing the Steering Wheel and the Pilot House Meter Panel

nected to one of the propellers by a short shaft, and mechanically independent of each other, the power can be distributed and concentrated where it is needed, and any speed or direction of rotation obtained on either propeller, irrespective of that of the prime mover, be it turbine or Diesel engine. Furthermore, the bow propeller can be turned over at such a speed that the power saved in driving it electrically is about equal to the total electric losses. This fact was demonstrated by a series of tests, described in the December, 1920, issue of MARINE ENGINEERING AND SHIPPING AGE by Commander S. M. Robinson, U. S. N. On the Diesel engine electric ferryboats this "pilot motor" speed is obtained by strengthening the field of the forward motor. After the proper speed has once been found, it can be made the subject of an automatic setting through the control panel. On the turbine electric boats, the induction motors driving the propellers are designed for operation with two sets of poles, provision for shifting from one to the other being made in the control panel.

MANEUVERING ABILITY INCREASED

Of the other features mentioned in connection with electric drive, the one of next importance in ferryboat practice, is probably maneuvering ability. Such a boat, operating as it does in crowded harbors, must be under absolute control, not only as regards forward speed, but for stopping and reversing. With electric drive, since only the speed of the motor must be altered, stopping and reversing are both only a matter of seconds as has been thoroughly demonstrated in the case of the electric ship. In addition, the control may be located in the most advantageous position—in the pilot house itself, if desired, so that the ease with which the boat



Longitudinal Section and Plan of Engine Room of San Francisco Diesel-Electric Ferryboat

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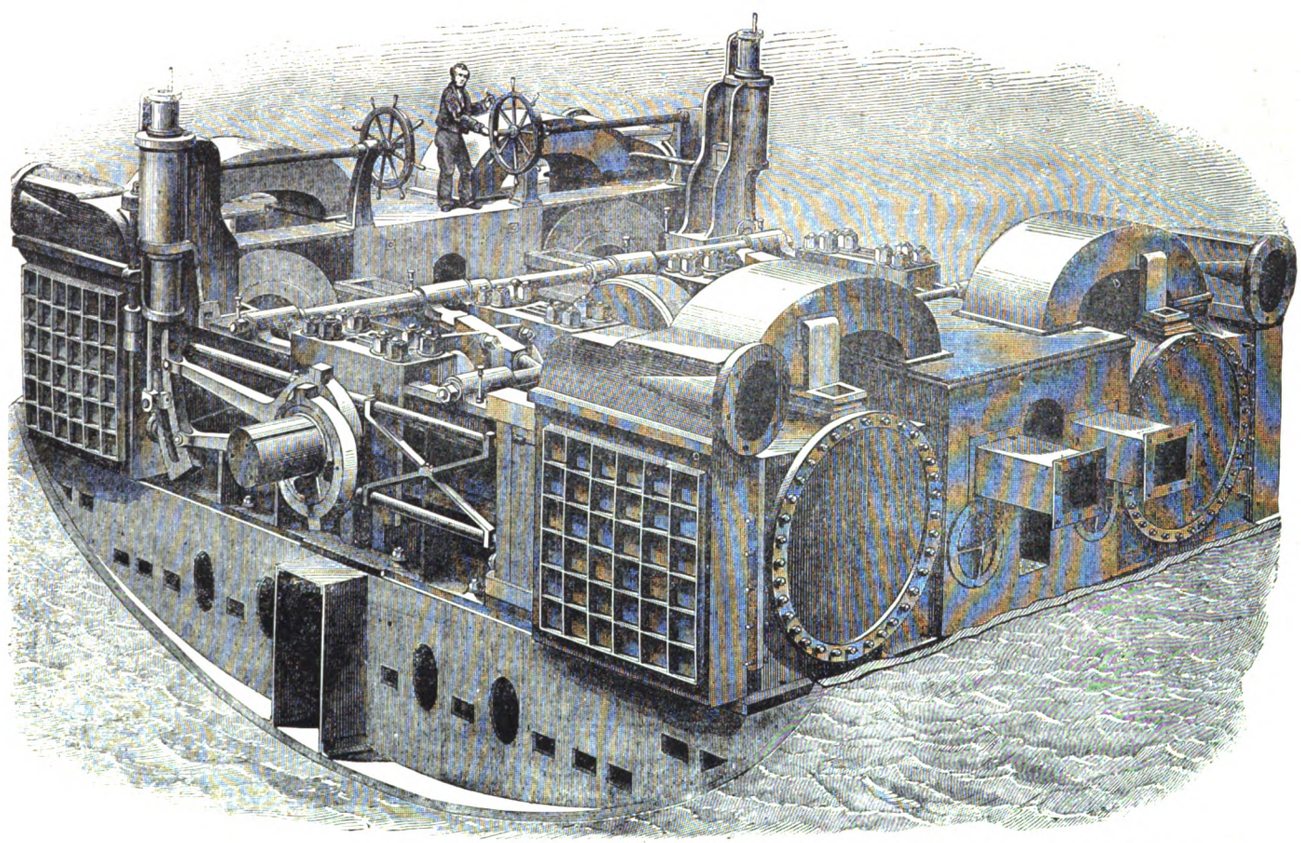
may be handled in emergencies is greatly increased. Maneuvering ability is also a decided asset in boats that are required to dock as rapidly and smoothly as are ferryboats.

The character of the propelling apparatus and the method of connecting the actual driving elements to the source of power are such that not only can the units be mounted so as to conserve the greatest amount of space, but so as to give the greatest of efficiency as far as power is concerned, since the power is applied just where it is needed. It also facilitates the use of electrically driven auxiliaries of various sorts, and the electric auxiliary is even more efficient on ships operating on an intermittent duty cycle than it is on cargo ships. All things considered, it is a safe prediction that the success experienced by the electrically driven ship will be equalled by that of the electrically driven ferryboat, and that the number of the latter will increase rapidly, as the realization of their advantages becomes more widely spread.

How a Famous Marine Engine Was Described 65 Years Ago

What "The Illustrated London News" of May 23, 1857, Had to Say About the "Screw Engines" of the Steamship Great Eastern

WHEN the famous steamship *Great Eastern*, designed by John Scott Russell, was under construction in Great Britain 65 years ago great curiosity naturally prevailed regarding the details of her hull and machinery and speculation was rife as to her probable performance when completed. She was to have an overall length of nearly 700 feet, which was more than twice the length of the *Great Britain*, the last large ship built, which in turn was 100 feet longer than any existing warship. Among her other spectacular features, besides size, she was to have a double hull, longitudinally framed and strengthened with two longitudinal bulkheads. Furthermore, she was to have three distinct means of propulsion—sails, paddle wheels and screw.



(Reproduction of Wood Cut from The Illustrated London News, May 23, 1857)

The Screw Engines of the "Great Eastern" Steamship, by James Watt and Company

The screw engines were manufactured by Messrs. James Watt and Company and as described in *The Illustrated London News* of May 23, 1857, were "the largest and most powerful engines ever yet constructed." This article is reproduced below not only because of the data which it contains regarding this early example of marine steam machinery but also because of the author's comments on the probable performance of the vessel. These predictions turned out to be at wide variance with the results actually achieved as she never made over 15 knots with both screw and paddle wheels. The article is also of interest because of the manner

Exporters to Discuss Shipping Bill

AT the annual convention of the American Manufacturers' Export Association, which will be held on October 26, special attention will be given to a consideration of the Administration Shipping Bill which is slated to come up for action in Congress next month. During the convention the association will hold a merchant shipping session at which Homer L. Ferguson, president of the Newport News Shipbuilding and Dry Dock Company, will preside. It is understood that the list of speakers at this special session will include W. A. Harriman, head of the United American Lines; Edward C. Plummer, of the United States Shipping Board, and other important speakers.

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in which it is written which is typical of the style of technical writing at that time. The article is as follows:

"There are four cylinders, each of eighty-four inches diameter, for driving the screw of this vessel. The length of the stroke is four feet, and the makers reckon that the engines will make about forty-five revolutions per minute. The cylinders lie on their sides, as is a common arrangement in screw engines: the piston-rods protrude through the ends of the cylinders nearest the central shaft on the end of which the screw is hung, and the connecting rods attached to the piston-rods engage cranks in the screw shaft and turn it round just in the same manner as the arm turns round a grindstone. The pistons, which are solid plugs, pressed by the steam backwards and forwards in the cylinders, communicate their reciprocating movement through the medium of the piston-rods to the connecting rods; and in this way the screw shaft is turned round, and the vessel is screwed forward in the water just as a screw auger turned round advances in a piece of wood, or a corkscrew in a cork.

"The pressure of the steam in the boilers is 25 pounds on each square inch. The total heating surface in the boilers of the screw engines is about 30,000 square feet. The nominal power of the screw engines is 1,700-horsepower; and, if they work up to four times their nominal power, which is not an unusual performance, the actual indicated power will be 6,800-horsepower. The area of that part of the cross section of the ship which falls beneath the water line is about 2,000 square feet, when the vessel is drawing 28 feet of water. The estimated amount of water evaporated by the boilers of the screw engines per hour is 3,150 cubic feet, and the area of the grate bars is 1,218 square feet.

"The screw is formed with four blades. Its diameter is 24 feet, and its pitch or the distance which it would advance during each revolution if it worked in a solid body, like a corkscrew penetrating a cork, is 44 feet.

"In addition to the screw, the vessel is supplied with paddle-wheels driven by four engines, each of 72 inches diameter of cylinder and 14 feet stroke, and rated collectively at 1,000 nominal horses' power. If we suppose that these engines also work up to four times their nominal power, it will be quite safe to reckon the actual power effective in propelling the vessel at 10,000 indicator horses' power.

"It is a question of much interest to determine what amount of speed this power will impart to the vessel. Messrs. James Watt and Company's anticipation is that the speed of the vessel will be about seventeen miles an hour; and from that to eighteen miles seems to be about the limit engineers have hitherto predicted. But we believe that these anticipations fall very far short of what the real speed will be, and which we do not hesitate to predict will turn out to be between twenty-four and twenty-five miles per hour. No allowance has been made in the existing computations of the speed for the great size of the vessel; yet it is well known that large vessels are more easily propelled, relatively with their proportion of power than small vessels, as is popularly manifested at every yacht race, where an allowance of time is made for the smallness of the vessels; and, in France, where the variation in the resistance consequent upon size has been carefully investigated, it is found that the velocities attained by similar vessels, but of different sizes, vary as the square root of any linear dimension. A vessel, therefore, of twice the length of the *Himalaya*, and with four times the sectional area and four times the power, will be faster than the *Himalaya* in the proportion of the square root of 2 to the square root of 1, or 1.4 times; so that the *Great Eastern*, had she been built of the same size as the *Himalaya*, has proportion of power enough to attain speed of seventeen miles an hour, she will, with her existing dimensions, be 1.4 times faster, or go 23.8, nearly 24, miles an hour. By reckoning the resistance as proportionate to the immersed perimeter, the speed comes out as twenty-three miles. At the increased speed, however, the engines, if duly supplied with steam, will develop more power than at the computed speed, so that, in all probability, a speed of close upon twenty-five statute miles per hour will be attained.

"The existing mode of estimating the resistance by the area of the immersed midship section is erroneous, except in the comparison of vessels of similar dimensions. It is, in putting into motion a column of water by friction that the power of the engine in well-formed vessels is chiefly expended, and the magnitude of this column depends, not upon the area of the cross section, but the amount of rubbing surface it offers to the water. The resistance of rivers is measured by the length of the outline in the cross section of the bed; and large rivers, with the same declivity, run much more swiftly than small. In like manner it should be by the immersed perimeter of the cross section that the resistance of ships should be measured, and when this is done it will be seen how very much less is the proportionate resistance of large vessels. A speed of thirty miles an hour in steam vessels is not, we are persuaded, very distant of attainment. Nor does it appear probable that at high velocities the resistance will be found to increase at the same rapid rate as at low. It is the adhesion of the water which at low speeds consumes power, and this adhesion moves the contiguous water because it is easier to do so than for the vessel to pass over it as if rubbing on a solid. But as with every increase of speed a thicker film of water adheres, the resistance occasioned by moving this mass of water will gradually become so great that it will be easier for the vessel to rub over the film than to drag it with her; and when this takes place the friction will thereafter follow the law which obtains in the case of solid bodies, and the resistance will no longer increase as the square of the velocity. At what point the equilibrium between the adhesion and the friction will be attained is a question which experiment must determine; but the apprehension of the fact that it will be attained at some determinable velocity gives warrant for the expectation of higher rates of speed in steam navigation than has heretofore been thought possible of attainment.

"The success of the *Great Eastern* as a commercial enterprise depends mainly upon her capability of realizing some such speed as twenty-five miles an hour. With such a speed she can command employment on any station, and can also compel the Government to give her a subvention for carrying the mails. With such an ordinary rate of speed as sixteen or seventeen miles an hour her commercial success is far more problematical. Moreover, with so large a cost a vital element is time. She must neither be a day longer on the voyage nor a day longer in harbor than is absolutely indispensable, but must be driven at such a rate as to make the capital productive. Taking the cost at £500,000, and the interest and depreciation at only ten percent upon this amount, we have about £1,000 a week of expense from this source alone. The actual amount chargeable to this item will be very much more than is here reckoned, but the approximation is sufficient to show the importance of attaining and maintaining high speeds on this sole inducement. Of the twenty-five miles an hour we have no doubt whatever, if there is the steam; and the boilers will produce the steam if the draft is sufficient. In most steam-vessels the draft is too sluggish, and the heat in the furnaces is not sufficiently intense. It has been proposed to use anthracite coal in the *Great Eastern*, but this is an experiment, and Welsh coals can be more safely depended on. The bridges at the ends of the furnaces should be high, so as to retain a high temperature in the furnace, which both consumes the coal more effectively and compels more of the heat to enter the water in the region of the furnaces—thus leaving less work for the tubes or flues to do. There should be good steam jets in the chimneys, so as to ensure a strong draft. With these simple precautions we have no fear of the speed; and, as the vessel is the strongest vessel ever sent to sea, there can be no doubt of her complete seaworthiness. The auxiliary engines for turning the screw round when the screw engines are not at work are, in our judgment, unnecessary; and every engine or piece of machinery not absolutely necessary is a complication and disparagement. Simplicity and fewness of parts to look after and keep in repair is a most important desideratum in steam navigation. Transcendentalism will not work in such a sphere, and in our judgment some of the refinements introduced into the *Great Eastern* might have been advantageously omitted. But in all its main features there can be no doubt whatever of the soundness of the design or of the excellence of the execution, while we believe that the performance of the vessel will exceed everything which the most sanguine supporters of the enterprise have ventured to anticipate, and will far outrun the prognostications which engineers, overlooking the element of size, have hitherto formed."

Broken Propeller Blades on 9,500-Ton Vessels Replaced With Aid of 4,500-Ton Floating Dry Dock

DURING the month of July two of the Matson Navigation Company's single screw steamers, the *Manukai* and *Manulani*, each of 9,500-tons gross register, arrived in Honolulu in crippled condition, due in both cases to the same mishap—the loss of one blade of its propeiler. The nature of the accident, which was identical in both cases, is shown in Fig. 3.

The contract for replacing the broken propeller blade on each of these steamers was awarded to the Honolulu Iron Works and the work was carried out on the 4,500-ton floating dry dock of the Inter-Island Steam Navigation Company of Honolulu. This dry dock, which has wooden pontoons and steel wings, was built in 1913 from designs by William T. Donnelly, consulting engineer, New York. Al-

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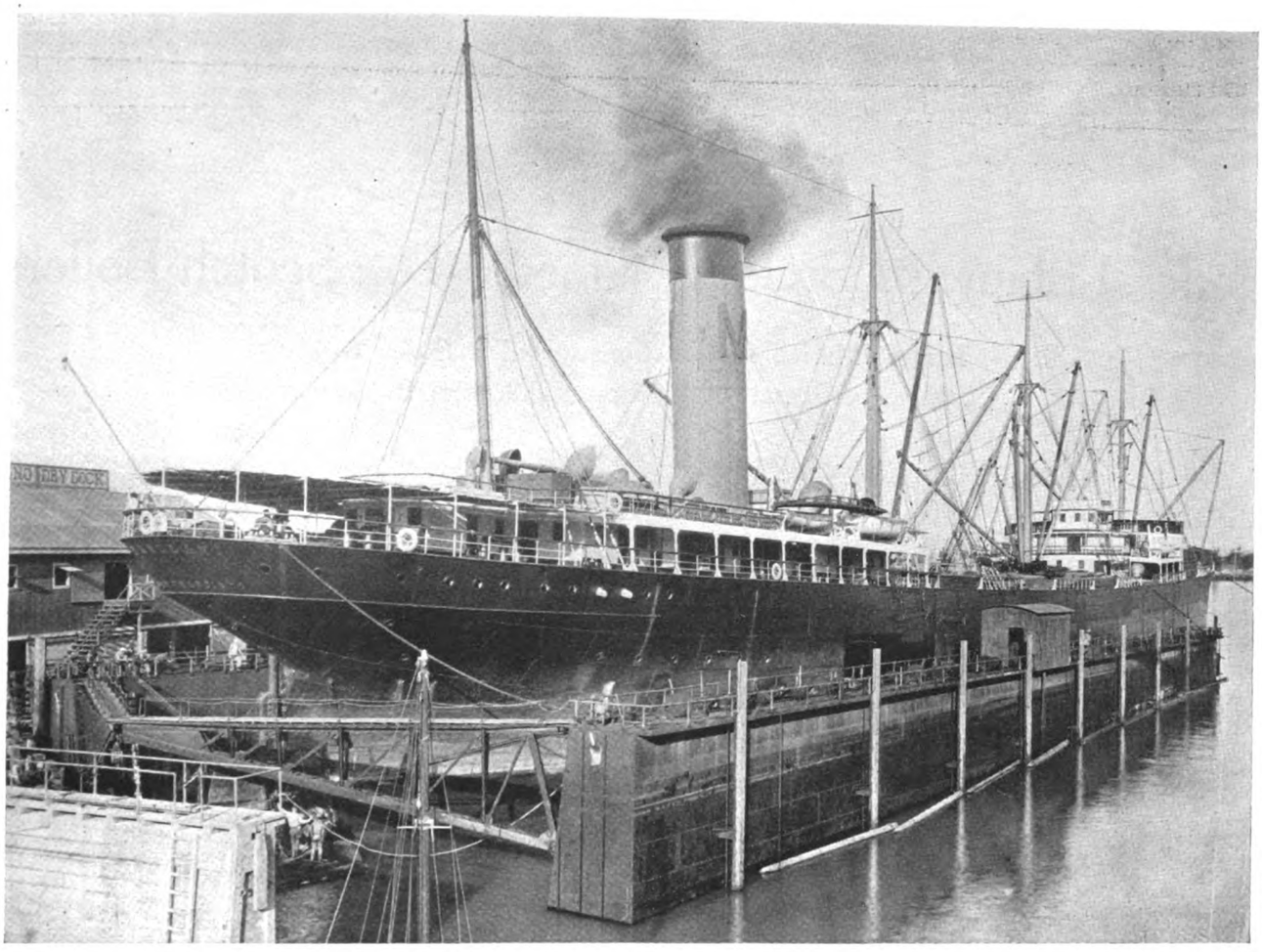

Fig. 1.—Lifting Stern of 480-Foot Steamship Manulani in 300-Foot Floating Dry Dock at Honolulu for Propeller Repairs

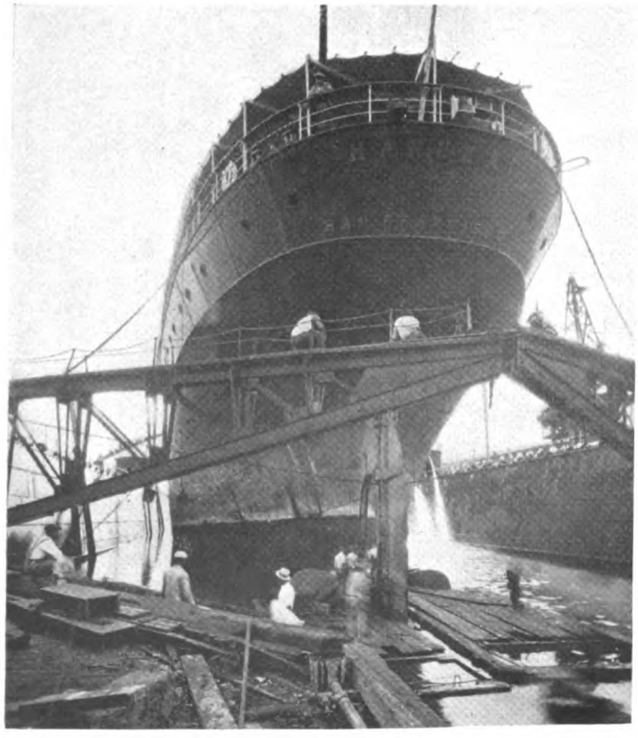

Fig. 2.—Replacing Broken Propeller Blade of S.S. Manukai on 4,500-Ton Floating Dry Dock at Honolulu

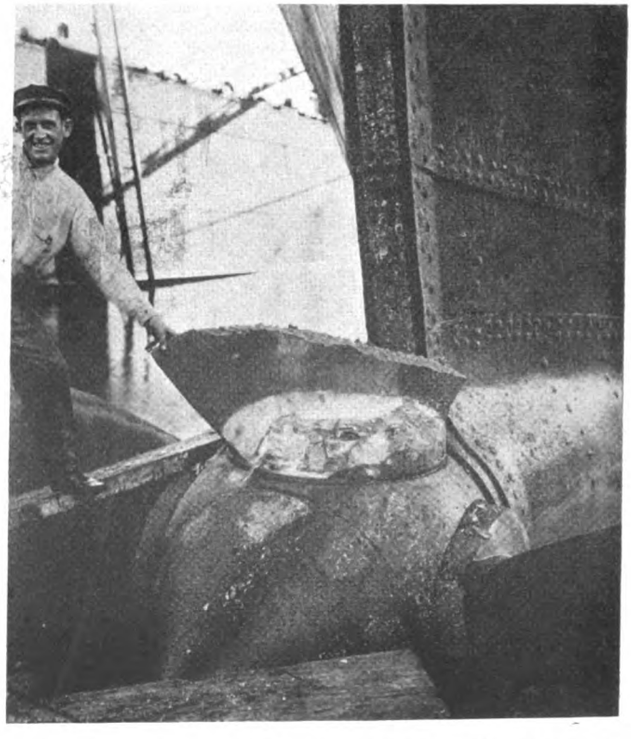

Fig. 3.—Broken Propeller Blade on the Manukai. Identically the Same Mishap Occurred on the Manulani

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though the dock has a lifting capacity of only 4,500 tons and its length over the wings is only 300 feet, nevertheless it was found possible, as shown by the illustrations, to lift the vessels, which in each case are over 9,500 tons gross register, and have a length of 480 feet, sufficiently to expose the propeller so that the broken blade could be replaced.

In the case of the *Manukai,* which had on board at the time of docking 3,200 tons of cargo, making a docking tonnage of 12,747, the propeller blade was replaced in two hours and 15 minutes. The work on the *Manulani,* which had on board 4,400 tons of cargo, giving a docking tonnage of 13,956, was finished in two hours flat.

Federal Shipyard Building Nine 80-Ton Scotch Boilers

Largest Marine Boilers Constructed in New York District to Operate at 225 Pounds Working Pressure

MANY special features of construction, due to their size, and the weight of materials used, have been incorporated in the nine single ended Scotch marine boilers which are now under construction for the Luckenbach Steamship Company at the Federal Shipbuilding Company's plant, Kearny, N. J. These boilers, which have a diameter of 17 feet 6 inches and a length of 13 feet, are intended for installation in ships of the Luckenbach fleet, which are being reconditioned at the Baltimore plant of the Bethlehem Shipbuilding Corporation. The boilers will be used to replace watertube boilers which were removed from the vessel.

Construction of the very highest quality has been maintained to meet the requirements of the United States Steamboat Inspection Service, the American Bureau of Shipping and Lloyd's Register of Shipping. The boilers are designed to burn oil under the heated forced draft system. The fact that the dry weight of each boiler will be approximately 80 tons gives an excellent idea of their unusual size. The weight of the shell alone with butt straps is about 67,000 pounds, while 3½ tons of rivets are used in each boiler. In the case of the butt straps, the rivets used are 8⅝ inches long and weigh 8¼ pounds each. The largest shell plate is 243⅛ inches by 144¼ inches by 2 inches and weighs 10 tons while the bottom heads are cut from plates 232⅛ inches by 164¼ inches by 1-3/32 inches and weigh 6 tons. The shell is made in one course and three plates are used in the circumference. The longitudinal seams are of double butt strap construction with both the inside and outside straps of equal width. The outside strap is 2 inches thick, as in the case of the shell plate, while the inside strap is 1¾ inches thick. Rivets 1⅞ inches in diameter are driven through holes drilled to 1-15/16 inches diameter. The efficiency of the plate used in the straps is 82.5 percent; the rivet efficiency 107.8 percent; and the combined plate and rivet efficiency 86.3 percent.

General Characteristics

In order to increase the life and efficiency of the boilers in service, the scantlings have been kept well in excess of the requirements of the classification societies. Special attention in this connection is called to the thickness of the outer butt strap, mentioned above, which was made 2 inches thick to conform with the specifications and is 23 percent

Fig. 1.—Side Bay of Federal Boiler Shop with Combustion Chambers Under Fabrication

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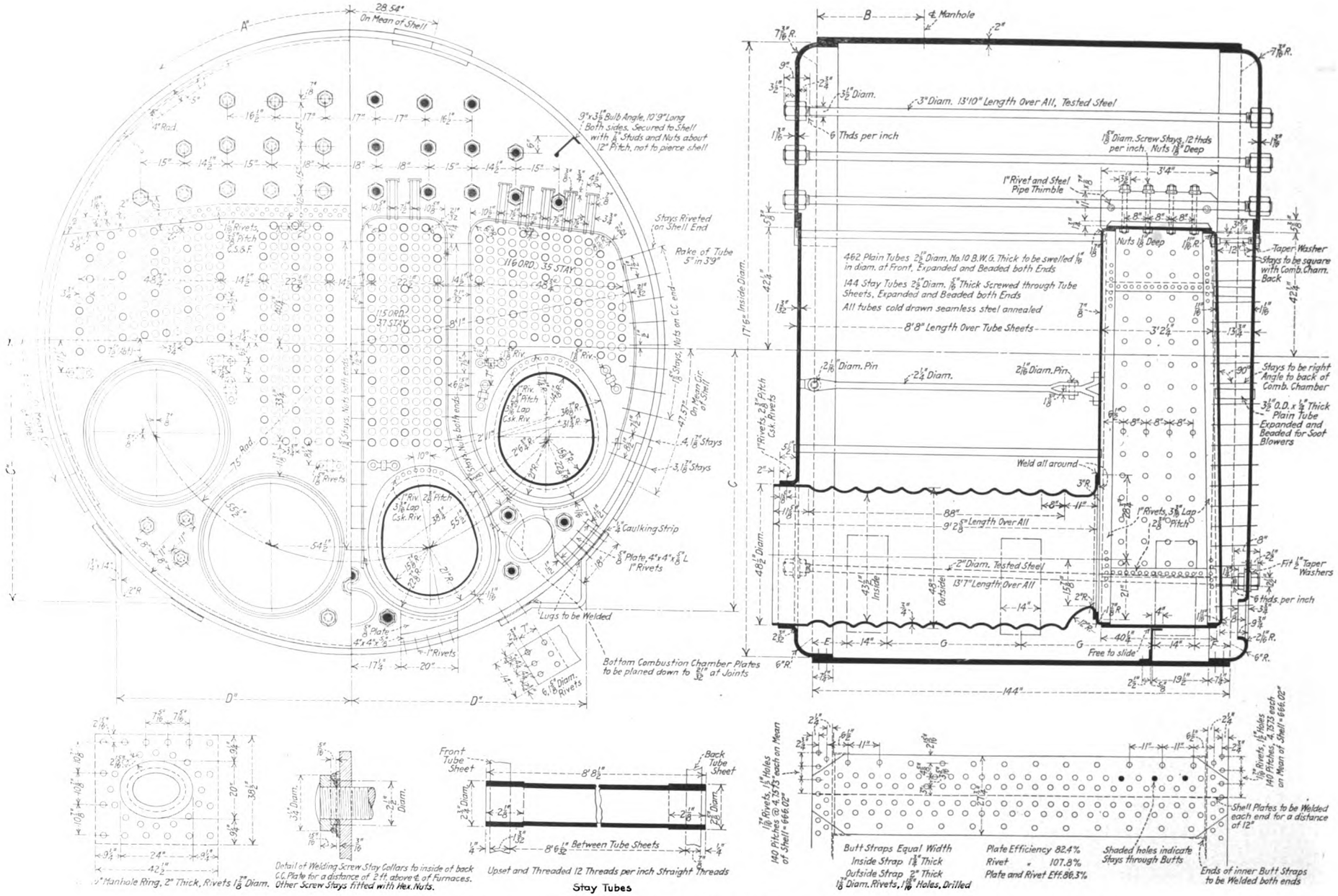
28.54" On Mean of Shell
9"x3½" Bulb Angle, 10'3" Long Both sides, Secured to Shell with ⅞" Studs and Nuts about 12" Pitch, not to pierce shell
Stays Riveted on Shell End
Rake of Tube 5" in 3'9"
116 ORD. 35 STAY
115 ORD. 37 STAY
Lugs to be Welded
Bottom Combustion Chamber Plates to be planed down to 6/32" at Joints
Caulking Strip
Plate, 4"x4"x⅝"L 1" Rivets
Manhole Ring, 2" Thick, Rivets 1⅛" Diam.
Detail of Welding Screw Stay Collars to inside of back C.C. Plate for a distance of 2 ft. above ℄ of Furnaces. Other Screw Stays fitted with Hex. Nuts.
Front Tube Sheet
Back Tube Sheet
8'8½"
8'6 1/32" Between Tube Sheets
Upset and Threaded 12 Threads per inch Straight Threads
Stay Tubes
℄ Manhole
3" Diam. 13'10" Length Over All, Tested Steel
6 Thds per inch
1⅛" Diam. Screw Stays, 12 thds per inch, Nuts 1⅛" Deep
1" Rivet and Steel Pipe Thimble
462 Plain Tubes 2½" Diam, No. 10 B.W.G. Thick to be swelled 1/16" in diam. at Front, Expanded and Beaded both Ends
144 Stay Tubes 2½" Diam. ⅝" Thick Screwed through Tube Sheets, Expanded and Beaded both Ends
All tubes cold drawn seamless steel annealed
8'8" Length Over Tube Sheets
Taper Washer
Stays to be square with Comb. Cham. Back
Stays to be right Angle to back of Comb. Chamber
3½" O.D. x ⅛" Thick Plain Tube Expanded and Beaded for Soot Blowers
Weld all around
88"
9'2⅝" Length Over All
2" Diam. Tested Steel
13'7" Length Over All
Fit ½" Taper Washers
6 thds per inch
Free to slide
144"
Butt Straps Equal Width
Inside Strap ⅞" Thick
Outside Strap ⅞" Thick
⅞" Diam. Rivets, 1⅛" Holes, Drilled
Plate Efficiency 82.4%
Rivet " 107.8%
Plate and Rivet Eff. 86.3%
Shaded holes indicate Stays through Butts
Shell Plates to be Welded each end for a distance of 12"
Ends of inner Butt Straps to be Welded both ends

Fig. 2.—Structural Arrangement of New Marine Boilers with Details of Longitudinal Seams, Manholes, Tubes and the Like

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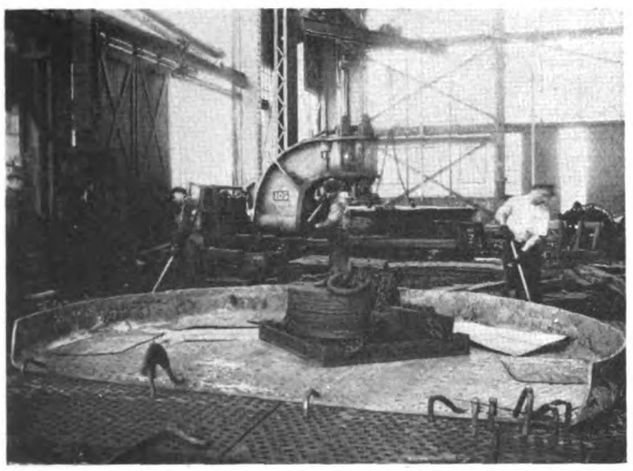

Fig. 3.—Furnacing and Annealing Boiler Head

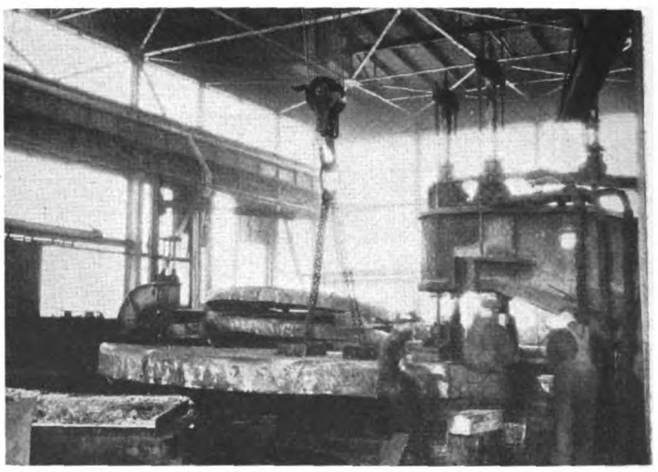

Fig. 5.—Flanging Lower Head

in excess of the requirements. Because of the extreme proportions thus provided, ample space has been available for a wide spacing of tubes and an unusually wide space between the lower banks of tubes and the furnaces. This feature, because of the possibility of adequate maintenance and cleaning facilities, will insure a high operating efficiency of the boilers at all times. The steam space ratio of 0.29, especially for a boiler of this size, gives a very large steam space and will tend to insure against priming. As a further preventative against priming in case of the ship rolling, two swash plates are provided by the installation of a 9-inch by 3½-inch bulb angle on each side of the shell above the waterline.

Each combustion chamber is supported from below by a stool or saddle riveted to the shell plate. These saddles are built up of 2½-inch by 2½-inch angles and steel webs of ⅝-inch plate so installed as not to interfere with access from the manholes and so that the combustion chamber is free to move.

All flange plates have large radii, those of the main heads being about 5 inches inside of the plate. Care in all cases has been taken that the shell plates and butt straps are circular in form and that the top of the back connections are well rounded at the corners.

There are three 12-inch by 16-inch manholes located in the lower back head between the furnaces and one near the top of the back head in the shell. The top heads are well braced with twenty-four 3-inch steel stays and the wide spaces in the lower heads and combustion chamber tube sheets are supported with eight 2½-inch crowfoot stays.

All tubes are of cold drawn seamless steel annealed and are 2½ inches outside diameter. The ordinary tubes, of which there are four hundred and sixty-two, are of No. 10 B. W. G. material, while the one hundred and forty-four stay tubes installed are 5/16-inch thick. The ordinary tubes are swelled 1/16 inch in diameter on the front end and the stay tubes upset and threaded on both ends. The tubes have a length of 8 feet 8 inches over tube sheets and are expanded and beaded over on both ends.

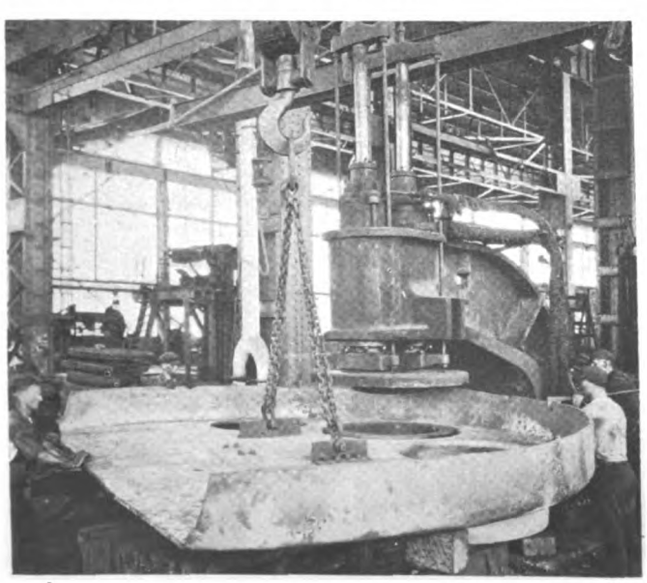

Fig. 4.—Flanging Furnace Holes in Front Head

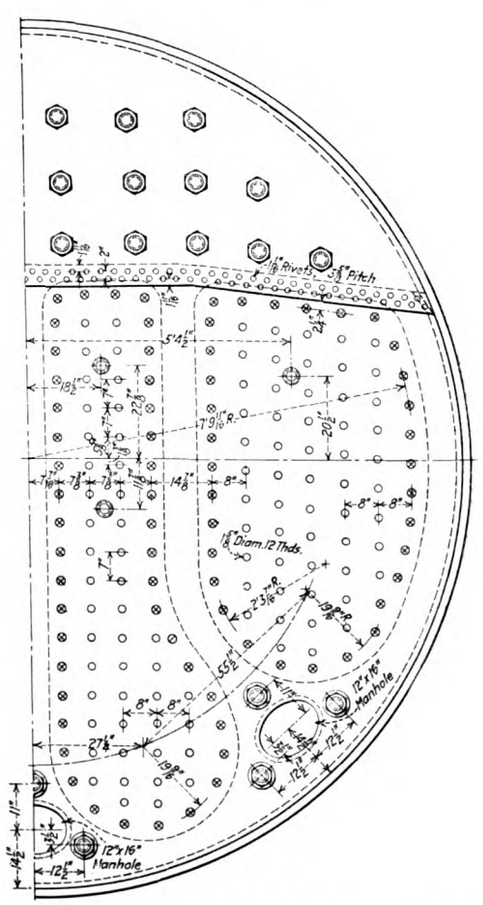

Fig. 6.—Details of Back Head of 80-ton Boiler

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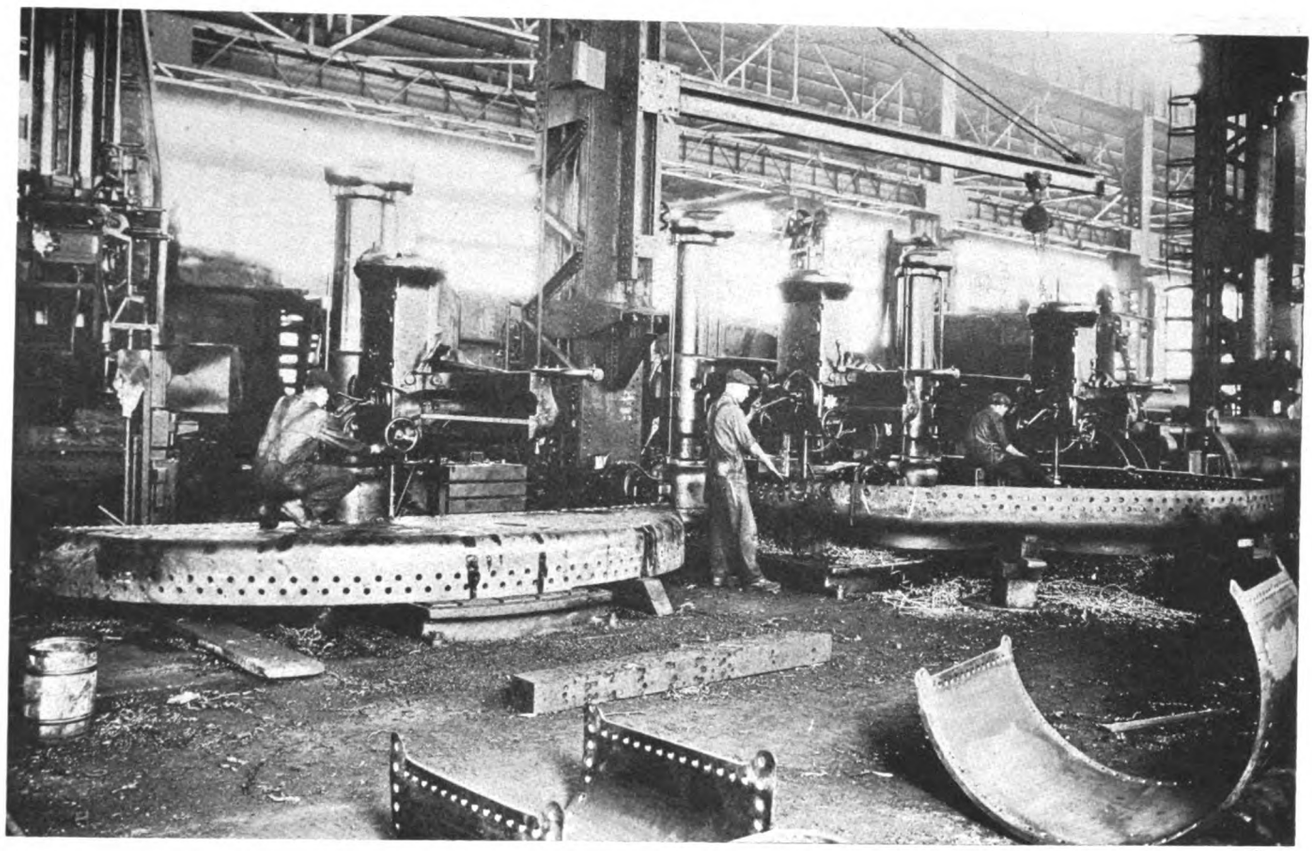

Fig. 7.—Cutting Tube Holes and Stayholes in Boiler Heads

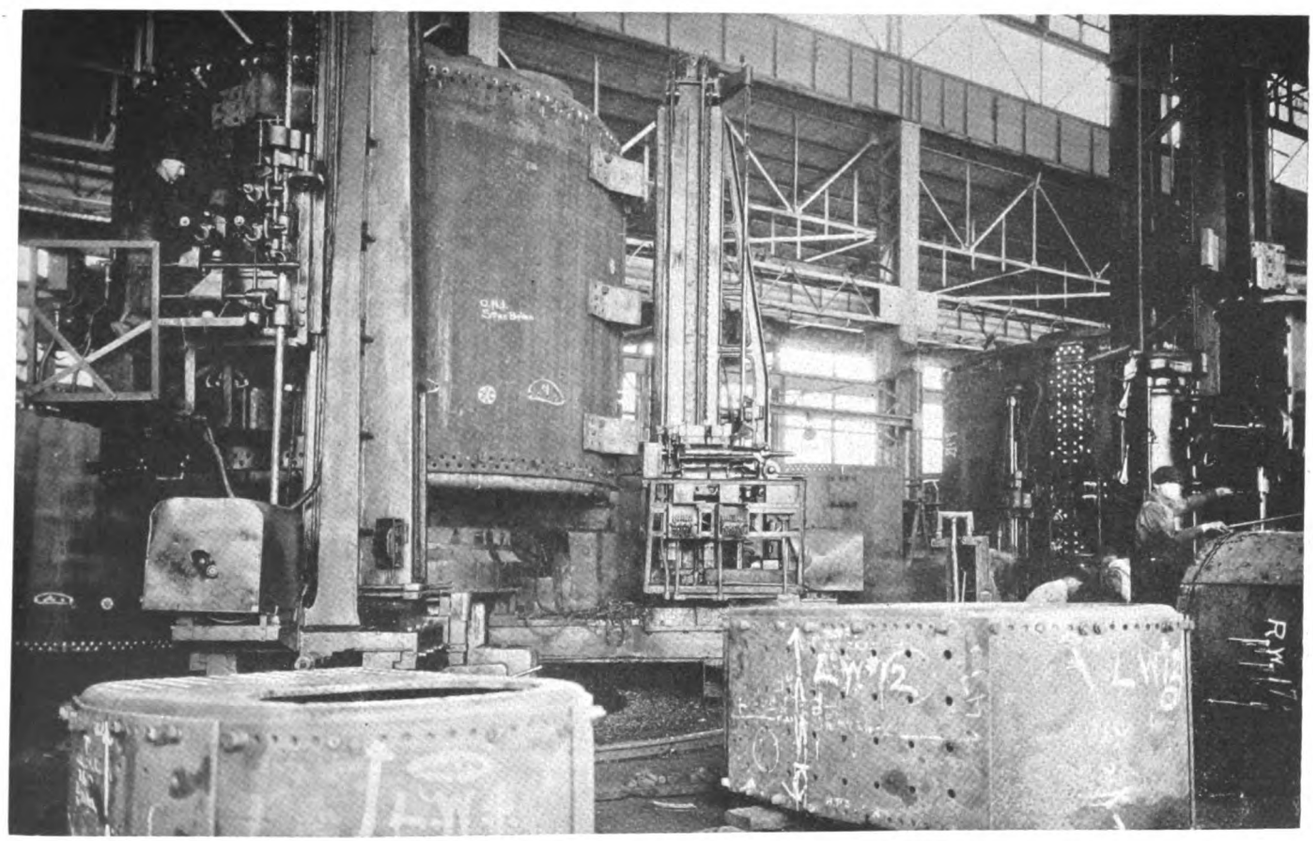

Fig. 8.—Drilling Holes in Boiler Shell

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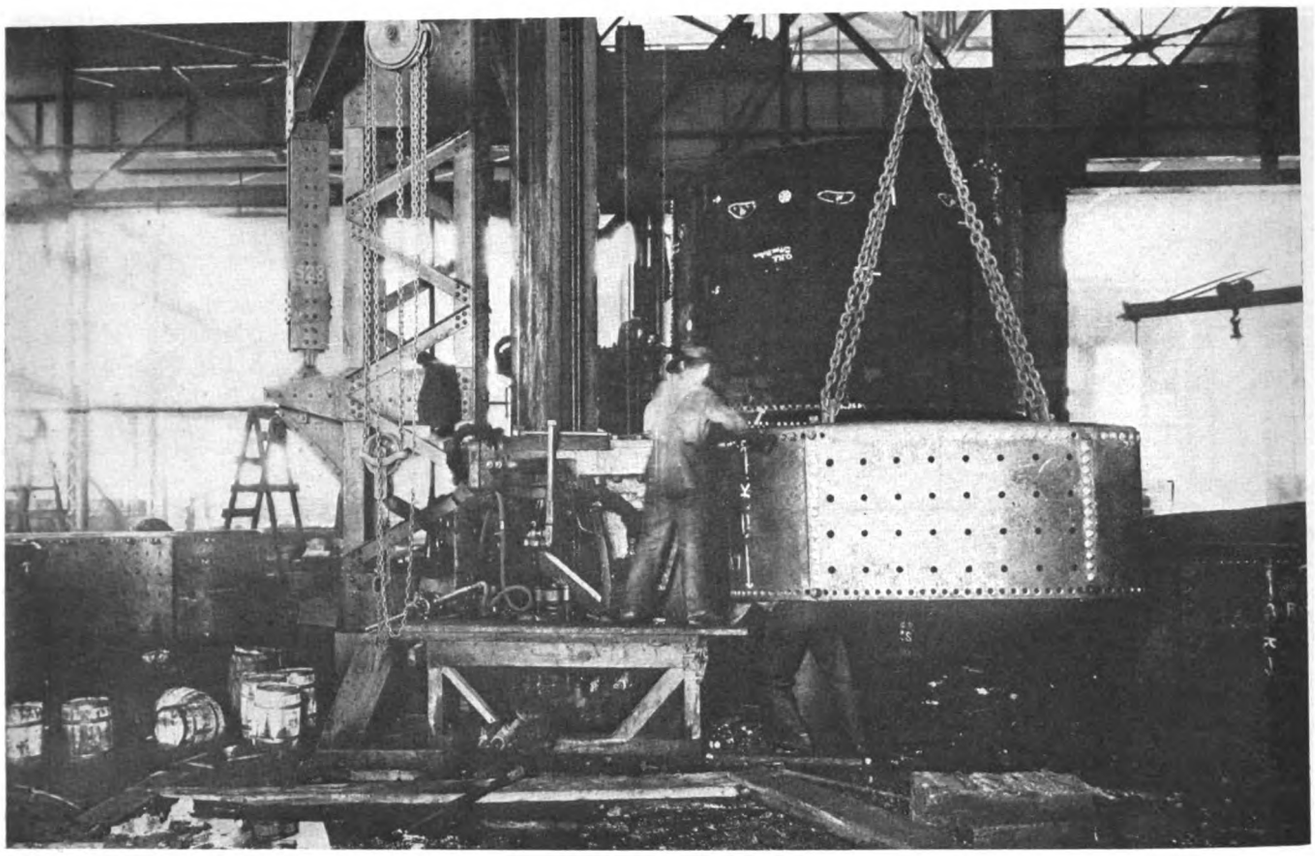

Fig. 9.—Riveting Combustion Chambers

COMBUSTION CHAMBERS

There are four separate combustion chambers in each boiler, each chamber being made up of 7/8-inch thick tube sheet and 11/16-inch thick back sheet and four wrapper plates. The top and side wrapper plates are 21/32-inch thick and the bottom plate 1 1/16-inches thick. All seams are single lap riveted with 1-inch countersunk rivets.

The backs of the combustion chambers have a 4-inch slope while the tops of the wing combustion chambers slope down toward the shell 5 inches from the center. All screw stays connecting the back sheets with the back head of the boiler are set in normal to the combustion chamber sheet. The screw stays are finished smooth between the plates to a diameter equal to the root of the threads.

Four furnaces of the Morison corrugated suspension type are fitted in each boiler and these have an inside diameter of 43½ inches. These furnaces have horse-collar connections to the combustion chamber with enlarged front ends to permit withdrawal.

Each boiler has six supporting saddles, three on each side, made of 1¾-inch plate 14 inches long. These saddles are secured to the shell with twelve 1⅝-inch rivets and a calking strip ¼-inch thick inserted between the shell and the saddles.

A perforated dry pipe 7 inches in diameter is fitted the full length of the shell with a cap on the end and securely fastened to the shell.

LARGE AMOUNT OF WELDING USED

In order to insure a tight boiler at all times, under adverse operating conditions and the difficulty of maintaining boilers at sea, an unusual amount of electric arc welding has been done on all the boilers. The seams and stay nuts in the combustion chambers are welded up to a point 2 feet above the centerline of the furnace. The inside butt straps are beveled down on the ends to the thickness of the boiler head flanges and welded across the ends at that point and for a distance of 6 inches along the head flange and the same distance along the butt straps from the flange. Where the shell plates butt together they are beveled and welded for a distance of 12 inches from each end. The saddle lugs, which are fitted with a ¼-inch calking strip, as indicated before, are welded on the inside of the lugs to the shell.

All seams of the combustion chambers in contact with flame are welded inside and out to protect the edges of the plates and insure against any possible leaks. This welding is carried to a point 2 feet above the centerline of the furnaces. All screw stays up to a point 2 feet above the centerline of the furnaces are fitted with special round collar nuts which are welded after being screwed on the stays.

All welding is built up of several layers to the required amount, each layer being thoroughly wire brushed and hammered before the succeeding layer of welding material is added. The finished weld in all cases is then peaned with pneumatic hammers.

FITTINGS AND MOUNTINGS

Six Diamond rear end soot blowers are fitted to each boiler; one in each wing combustion chamber and two in each inboard combustion chamber to enable all tubes being thoroughly swept by as near a direct jet of steam as possible.

All connections to the boiler heads and shell are fitted to nozzles of open hearth steel forgings which are riveted to the boiler. These nozzles are made of sufficient length to allow removal of valves without disturbing the lagging to get at the nuts and bolts. The main and auxiliary feed nozzles have necks extending through the head of the boiler and are fitted with a flange securely screwed on from the inside of the boiler. The zincs are supported by hooks on straps suspended down between the nests of tubes from the main stays. Thirty-six zinc slabs 12 inches by 6 inches by ½ inch are fitted.

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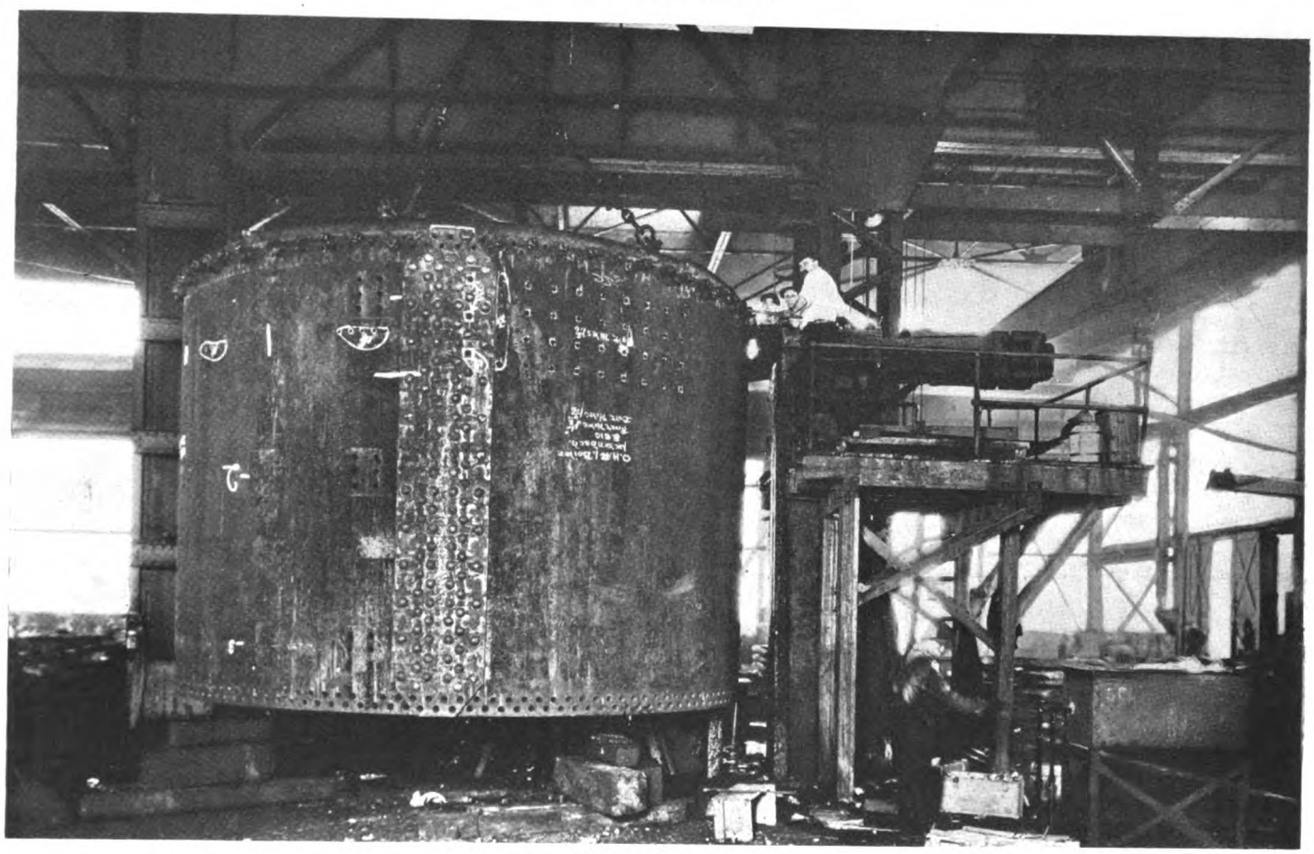

Fig. 10.—Fitting Up Head in Marine Boiler Shell

GENERAL DETAILS OF BOILERS

Diameter of boilers (inside)	17 feet 6 inches
Length (over bottom heads)	13 feet 0 inches
Thickness of shell	2 inches
Number of furnaces	4
Inside diameter of furnaces	43½ inches
Number of plain tubes	462
Number of stay tubes	144
Outside diameter of tubes	2½ inches
Distance between tube sheets	8 feet 6 1/32 inches
Heating surface of tubes	3,370 square feet
Heating surface of furnaces	425 square feet
Heating surface of combustion chambers	465 square feet
Total heating surface	4,260 square feet
Net area through tubes	15.4
Steam pressure	225 pounds
Steam space	0.29
Equivalent grate area with 5-foot 6-inch grate	79.75
Heating surface ÷ grate area	53.4
Weight of boiler, dry	80 tons

The main steam connection is seven inches in diameter and is fitted with a wrought iron slotted dry pipe. A 1¼-inch Weir hydrokineter is fitted on the shell between inboard and wing furnaces for circulating water when starting to get up steam. A scum pan and salinometer cock are fitted to head of boiler. There are two water columns and three try cocks fitted to the head of the boiler.

METHODS OF MANUFACTURE

All work of manufacture from the flat plates to testing has been done in the boiler shop of the Federal Shipbuilding Company which is one of the best equipped marine boiler shops in the country. On account of the great size and weight of the boilers special and extra equipment was made up for handling the work through the shop.

The butt straps were formed to shape under a 200-ton hydraulic press. The 1⅞-inch rivets in the butt straps were driven by a 200-ton hydraulic riveter. Rivets in the circumferential seam of the back head were driven by a 150-ton hydraulic bull, while the rivets in the straight seams of the heads and the combustion chamber seams were driven by a 75-ton bull. In the circumferential seam of the front head the rivets were hand driven with pneumatic riveting hammers. Special riveters of 80 tons pressure were used for the seam at the furnace mouth which is riveted the complete circumference of the furnace.

Because of the extreme thickness of shell plates, it was necessary to start the curvature by hydraulic press for a short distance, so that the plates could be entered in the rolls. The outer edge of the longitudinal joint had to be finished by hydraulic press to fair up properly when assembled. The curvature of the butt straps was also imparted by hydraulic press.

All plates were taken apart after fitting up and the surfaces cleaned and burrs removed with emery wheels before reassembling to insure clean metal to metal joints. In reassembling the work for riveting, dowel pins were used to insure perfect alinement of holes.

These boilers in general represent the last word in Scotch marine boiler design and construction and their service records will serve to uphold the reputation for reliability under adverse conditions that this type boiler has gained in its years of powering the merchant ships of the world.

Simplified Type Direct Rudder Head Steering Gear

WORKING from the original barrel steering gear driven by a steam engine, through various stages of steam driven screw gears, the Bow, McLachlan & Company, Ltd., London, England, has developed an electrically operated direct rudder head gear which can be controlled by any of the customary methods at the various parts

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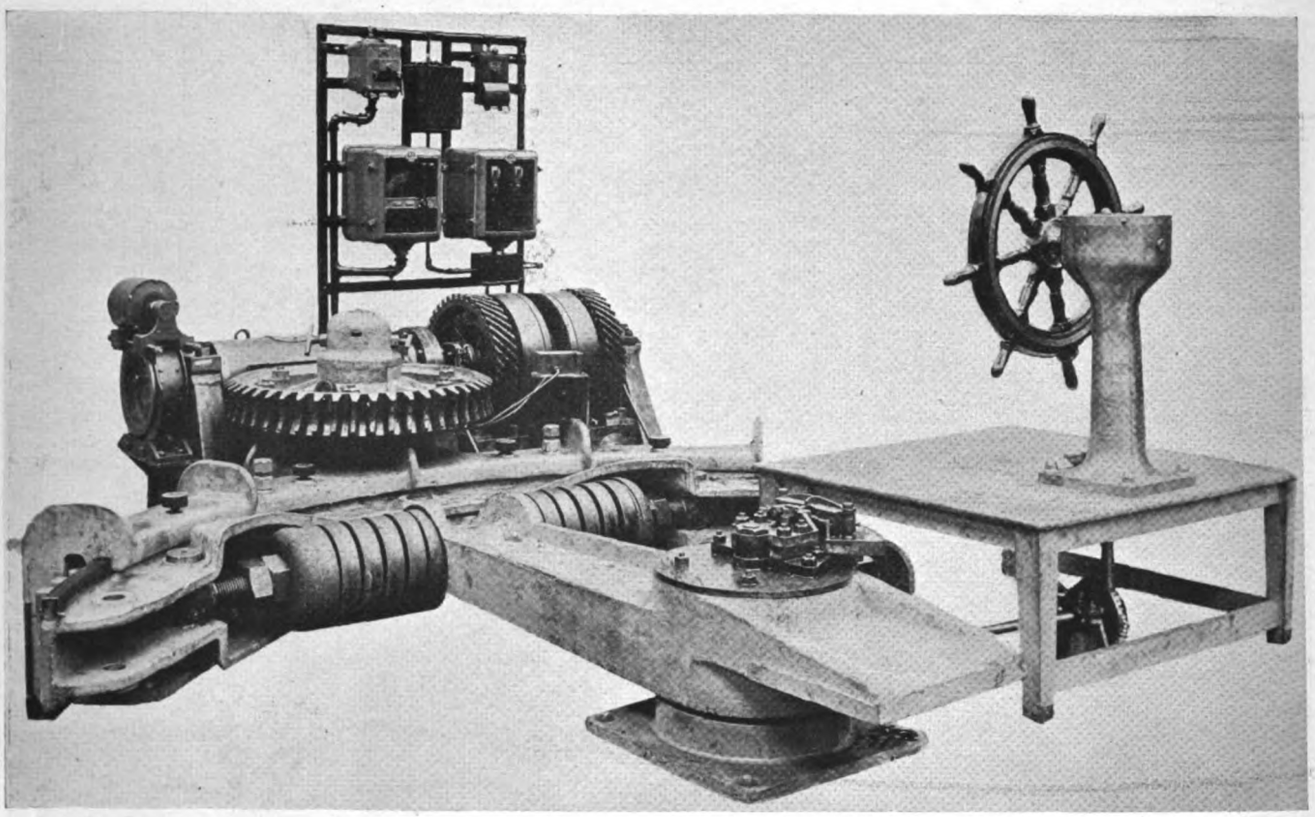
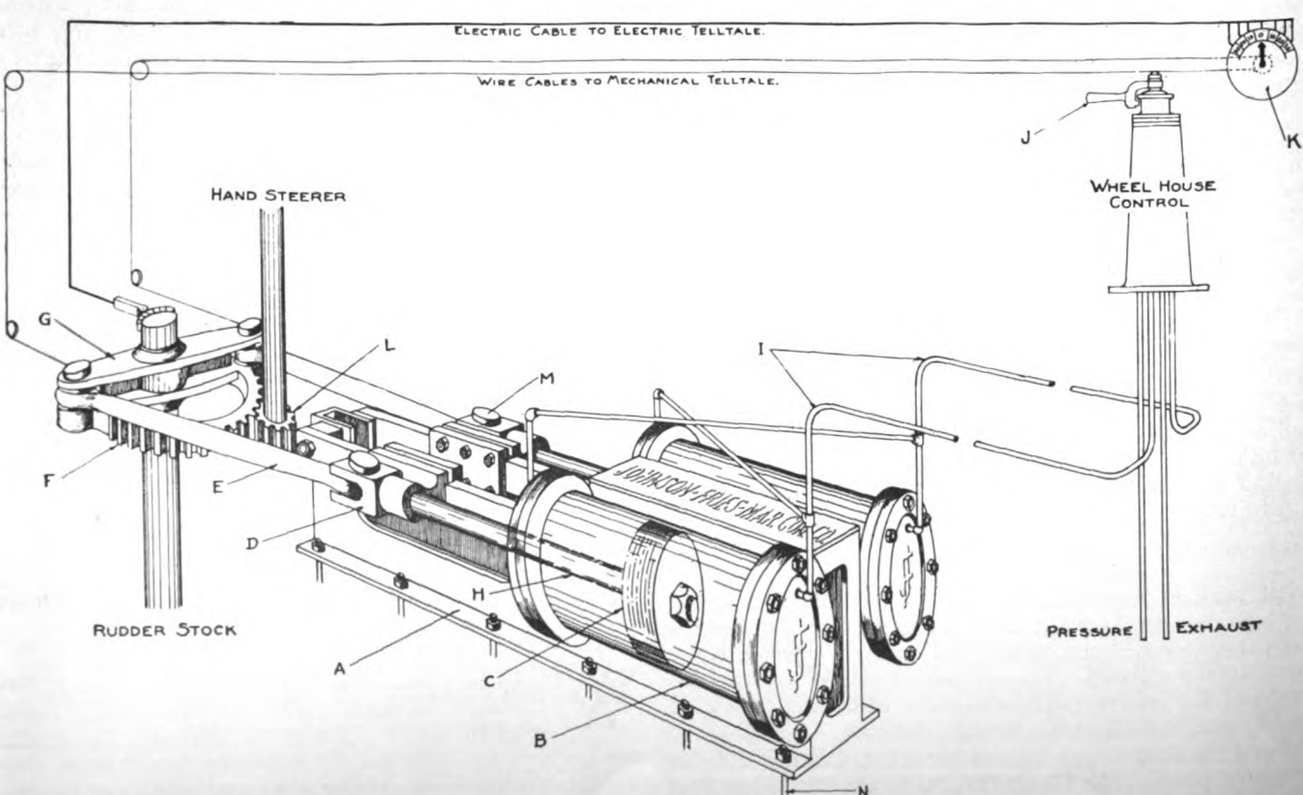


Electrically Operated Direct Rudder Head Gear Attached to "Guided Segment" Type Steering Installation

of a vessel from which it is desirable to operate the ship. The motor actuating the gears runs continuously and drives two electro-magnetic clutches which run loose on the driving shaft. These clutches run in opposite directions, thus controlling the forward and reversing action of the shaft. The shaft may be arranged to operate a number of different steering installations.

In the accompanying illustration, the shaft is attached to the "guided segment" gear. In this case, a worm is connected to the end of the shaft which meshes with a horizon-



Diagrammatic Sketch of Johnson-Fries Pneumatic Steering Gear

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tally mounted worm wheel carried on a spindle to which a toothed pinion is fixed. The latter meshes with a toothed segment connected through spiral springs to the tiller. Movement of the worm wheel shaft in one direction or the other turns the rudder to port or starboard as required.

Mounted on the rudder head is a new type of hunting switch which is actuated by the steering wheel. Motion of the wheel in one direction or the other completes the electric circuit to one or the other of the clutches and moves the rudder through the gearing described. When the rudder has moved to the angle corresponding to the angle of rotation of the steering wheel the hunting switch breaks the circuit to the acting clutch which releases the worm wheel shaft and stops further motion until the steering wheel is moved again.

To prevent overloading of the motor the clutches are arranged to slip at any pre-determined load without damage to themselves or resulting discrepancy between the rudder angle and position of the steering wheel corresponding to that angle.

Resistance of Ships to Propulsion

Methods of Estimating Power from Model Tests —Corrections in Passing from Model to Ship

By A. J. C. Robertson*

THE necessity for accurately calculating the power to propel a ship is so apparent that many attempts have been made to enunciate formulæ which will provide the information desired. We are all familiar with the well-known Admiralty formulæ,

$$\text{I. H. P.} = \frac{\Delta^{2/3} V^3}{\text{Constant}_1} \quad \text{or} \quad \text{I. H. P.} = \frac{V^3 M}{\text{Constant}_2}$$

where Δ is displacement in tons, V speed in knots and M area of midsection in square feet. We are probably also aware that the so-called constants vary enormously with size proportions and speed of the ship and, if the constant has to be guessed, we may as well guess the power at once.

A modification of the first formula recommended by A. E. Stevens,

$$\text{I. H. P.} = \frac{\Delta V^3}{\text{Constant} \sqrt{L}}$$

claims to give better results than the Admiralty formulæ but this constant varies through a wide range also with size of ship, draft ratio and speed ratio.

A very clever analysis of resistance was made by Professor Hovgaard in 1908 (Transactions of the Institution of Naval Architects) in which many provisional formulæ were worked out and curves plotted upon actual resistance curves, thus showing the measure of accuracy attained, but, though the resulting formula included wetted surface, coefficient of fineness, length, breadth, depth and speed, the "constants" were still found to vary considerably and in accordance with unknown laws.

This, however, is not surprising, for in the nature of things no formula of constant form can possibly take care of the infinite variations which can be made in the dimensions, proportions and form of a ship's hull. Even if all the dimensions are absolutely fixed, no two naval architects could possibly produce an identical set of lines.

Two such independent designs might and probably would have identical resistances at one speed, but the architects themselves could not say at what speed that would occur and the similarity would certainly not extend through any great range of speeds.

The major resistances which absorb the power used in the propulsion of a ship are here tabulated:

(a) Frictional resistance
(b) Wave making
(c) Eddy making
(d) Windage and rudder
(e) Restricted channel
(f) Wake deduction
(g) Propeller efficiency losses
(h) Shaft friction

And if power is measured inside the engine by indicator cards or similar methods, the initial friction losses of the engine must be added to this list.

Froude, many years ago, was able to enunciate the laws of comparison which have made it possible to estimate the effect of size on the resistance of a vessel. This law, also called the law of mechanical similitude as applied to ships, requires that for ships that are exactly similar except in size, as expressed in terms of a single dimension, L:

(a) corresponding speeds are speed proportional to $\sqrt{L}$.
(b) corresponding displacements are proportional to L^3.
(c) corresponding resistances are proportional to L^3.
(d) corresponding powers are proportional to $L^{3.5}$.

This law at once made it possible to look for a solution of the problem of propulsion by the testing of small models under conditions which could be maintained the same at all times, or at least where the changes were so small and so carefully measured that proper corrections could be made.

A large experimental tank was constructed for this purpose at Torquay in England many years ago, and at this tank the foundations of the science of ship resistance were well laid by Mr. Froude.

Application of Model Experiments

It was early demonstrated that the friction of the water on the skin of a ship did not strictly follow the law of mechanical similitude owing to the layer in contact with the ship acquiring a velocity in the same direction as the ship, thus making a difference between the apparent and the real speed of the ship through the water, and this change in velocity was found to be a direct function of the length of the vessel. This skin resistance could be expressed thus:

$$R_f = SfV^n$$

where S is the wetted surface and V the speed, f and n being constants for a fixed length, and could be tabulated for various lengths of ship. With this allowance for frictional resistance taken into account it has been found possible to calculate from model experiments items (a), (b) and (c).

The resistance and speed of the accurately cut model ship are electrically recorded for a large number of speeds, a run of the model being made at each speed. From this total resistance (usually measured in pounds) the calculated resistance due to the surface friction is subtracted, the remainder, usually designated as the residuary resistance, is multiplied by suitable factors for the required size of ship and to the result the calculated frictional resistance of the ship is added, giving the total resistance, usually expressed in effective horsepower.

That is the method in use at both the Washington and Ann Arbor model tanks in this country, but another method

*Naval architect, Munson Steamship Line, New York.

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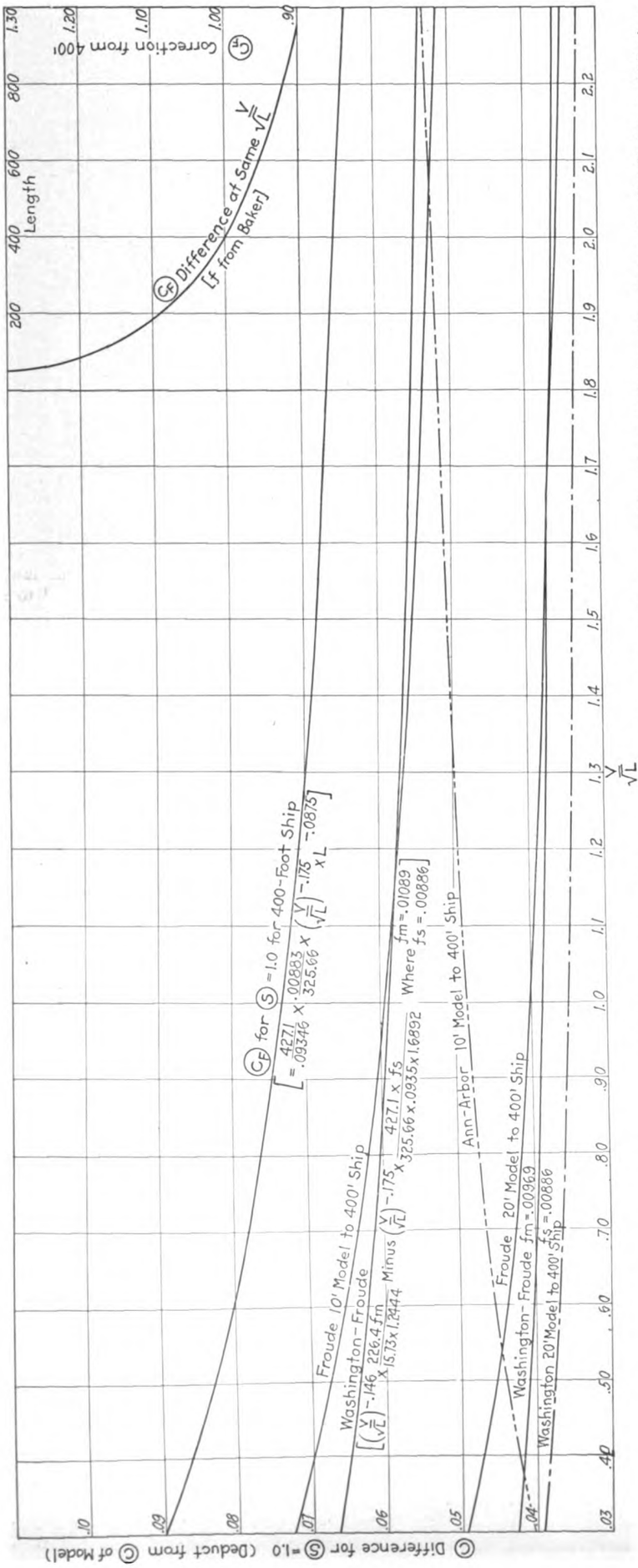
Length
Correction from 400'
Difference at Same V/√L [f from Baker]
Froude 10' Model to 400' Ship
Washington-Froude
Froude 20' Model to 400' Ship
Washington-Froude
Ann-Arbor 10' Model to 400' Ship
Washington 20' Model to 400' Ship
Difference for (S)=1.0 (Deduct from (C) of Model)
V/√L

Diagram Showing (1) the Value of (C_f) at (S)=1.0 for a 400-Foot Ship and (2) the Deduction from (C_f) of Ship with (S)=1.0 as Calculated by Using the Coefficients of Various Authorities for 10-Foot and 20-Foot Models and 400-Foot Ship

is possible. This is to calculate the horsepower of the ship directly from the resistance of the model and then deduct a certain amount due to the lesser resistance per square foot of surface for the large vessel as compared with the model. Either method will of course give accurate results, but the latter method has some advantages, in that it proceeds by differences, thereby preventing large errors and it can be carried out in such a way as to give a unit of resistance equally applicable to any size of ship with a unit correction value for variations in size.

This method, originated also by Froude, designates the unit of resistance

$$(C) = \frac{\text{E. H. P.} \times 427.1}{V^3 \Delta^{2/3}}$$

and the (C) correction in passing from the model to a standard size of ship (for convenience 400 feet is probably the simplest) is in the form of a small deduction from the (C) value of the model.

For vessels other than 400 feet long the (C) correction is very small and is a deduction for larger ships and an addition for smaller ones.

This method of expressing the ship resistance by (C) value is now practically universal in Europe, and when once adopted is sure to displace other methods.

The reasons for this are that (C) is very sensible to variations of resistance, it fluctuates less than most constants and is easily utilized for speed estimates. Moreover (C) values are now available for a very large number of ship models, tested through a wide range of speeds.

Calculations for the (C) Values

A more detailed examination of Froude's "constant" system of notation and the calculations for the (C) values will therefore be interesting, especially as the calculations involved in obtaining (C) from model experiments have been omitted from the usual text books.

Δ = Displacement in tons, salt water at 35 cubic feet per ton.
δ = Displacement in pounds, fresh water at density 1.0:1.026 salt water.
V = Speed in knots of 101.33 feet per minute.
R = Resistance in pounds.
L = Length on waterline in feet.
W = Wetted surface in square feet.
U = Length of side of cube having contents equal to displacement in cubic feet.

Then $U = \Delta^{1/3}$

K = Speed of wave of length $\frac{U}{2} = \frac{V}{\Delta^{1/3}}\sqrt{\frac{4\pi}{g}}$

with speed V in feet, seconds and g., the accelerating force of gravity, in feet per second.

Also $$\frac{C}{1{,}000} = \frac{R}{\Delta K^2}$$

and assuming that the specific gravity of sea water is 1.026—64 pounds per cubic

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EXTENSION OF MODEL TESTS TO SHIP

Design No. 2033

Test No. Ann Arbor 2033-B. Dated Aug., 1920. Name .....

ITEM	MODEL	SHIP
Displ. Length.....	10.0 Ft.	534.0 Ft.
Breadth	1.3125 Ft.	70.0 Ft.
Draft	.5875 Ft.	31.37 Ft.
Wetted Surf.	18.82 Sq. Ft.	53,678 Sq. Ft.
Displ.....	308.3 Lbs.	21,495 Tons
$Displ.^{2/3}$	45 63	773.

$$(S) = \frac{\text{Wetted Surf.}}{Displ.^{2/3}} \times \begin{cases} 15.73 \text{ for Model} = 6.49 \\ .09346 \text{ for Ship} = \end{cases}$$

$$S\Delta \text{ for Ship} \frac{\text{Displ.}}{(\text{Displ. Length} \div 100)^3} = 141.61$$

$$(M) = \frac{\text{Displ. Length}}{Displ.^{1/3}} \times \begin{cases} 3.966 \text{ for Model} = 5.87 \\ .3057 \text{ for Ship} = \end{cases}$$

$$\text{Midarea} = 2131.5 \text{ Sq. Ft.} \frac{\text{Midarea}}{\text{Breadth}^2} = \delta = .435$$

Prismatic Coeffs.: Forebody = .601 Afterbody = .719 Ship = .660 $\frac{\epsilon}{\lambda} = 1.42$

Analysis of Ends: $(1.0 - C_p)$ $\epsilon = .399$ $\rho = 281$ $\lambda = .320$

$$(C) \text{ For Model} = \frac{\text{Resist. in Lbs.}}{(\text{Speed in Kts.})^2} \times \frac{226.4}{Displ.^{2/3}} = \frac{\text{Col. 3}}{\text{Col. 4}} \times \left\{ \frac{11.32 \times 2}{Displ.^{2/3}} = .4961 = F_r \right\}$$

$$\text{E.H.P.} = C \text{ for Ship} \times \text{Speed}^3 \times \frac{Displ.^{2/3}}{427.1} = \text{Col. 11} \times \text{Col. 13} \div \left\{ \frac{427.1}{Displ.^{2/3}} = .5525 = F_e \right\} \begin{matrix} \text{Temp. of Water } 67^\circ \\ \text{Temp. Factor } F_t = 1.017 \end{matrix}$$

	Model				(C) Correction				Ship				
$\frac{V}{\sqrt{L}}$	Speed Ft. Per Min.	Resist. in Lbs.	$\left(\frac{V}{\sqrt{L}}\right)^2$	(C) $F_r \times$ Col. 3 $\div$ Col. 4	From Curves for S=1.0	Corrn. $\times$ (S) $\times F_t$ 6.60	(C) for 400′ Ship = Col. 5 − Col. 7		(C) Correction for Length from Curves	(C) for Ship =Col. 8 +Col. 10	Speed in Kts. =Col. 1 $\times \sqrt{\text{Len.}}$	Speed^3	E. H. P. =Col. 11 $\times$Col. 13 $\div F_e$
Col 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14
0.30			.0900		.0667								
0.35	112.15	.259	.1225	1.049	.0658	.434	.615		—.018	.597	8.088	529.0	572
0.40	128.18	.338	.1600	1.048	.0650	.429	.619		—.018	.601	9.244	791.0	860
0.45	144.20	.424	.2025	1.039	.0642	.424	.615		—.018	.597	10.40	1124 0	1214
0.50	160.22	.516	.2500	1.024	.0635	.419	.605		—.018	.587	11.55	1542.	1538
0.55	176.24	.616	.3025	1.010	.0629	.415	.595		—.018	.577	12.71	2054.	2145
0.60	192.28	.724	.3600	.998	.0623	.411	.587		—.018	.569	13.87	2670.	2750
0.65	208.30	.859	.4225	1.009	.0617	.407	.602		—.018	.584	15.02	3390.	3583
0.70	224.30	1.005	.4900	1.017	.0612	.404	.613		—.017	.596	16.18	4240.	4574
0.75	240.34	1.168	.5625	1.030	.0608	.401	.629		—.017	.612	17.33	5205.	5765
0.80	256.36	1.337	.6400	1.036	.0603	.398	.638		—.017	.621	18.49	6320.	7103
0.85	262.40	1.506	.7225	1.034	.0599	.395	.639		—.017	.622	19.64	7580.	8533
0.90			.8100		.0596								
0.95			.9025		.0592								
1.00			1.000		.0589								

foot, then the various constants for ship in salt water and model in fresh water will be as follows:

$$\text{Length Constant} \quad (M) = \frac{L}{\Delta^{1/3}} \times 0.3057 = \frac{L}{\delta^{1/3}} \times 3.966$$

$$\text{Skin Constant} \quad (S) = \frac{W}{\Delta^{2/3}} \times 0.09346 = \frac{W}{\delta^{2/3}} \times 15.73$$

$$\text{Speed Constant} \quad (K) = \frac{V}{\Delta^{1/6}} \times 0.5834 = \frac{V}{\delta^{1/6}} \times 2.047$$

$$\text{Resistance Constant} \quad (C) = \frac{1.3115\ R}{\Delta^{2/3}\ V^2} = \frac{226.4\ R}{\delta^{2/3}\ V^2}$$

$$= \frac{101.33 V \times R}{33{,}000} \times \frac{427.1}{\Delta^{2/3}\ V^3}$$

$$= \frac{\text{E.H.P.} \times 427.1}{\Delta^{2/3}\ V^3}$$

$$\left[\frac{226.4\ R}{\delta^{2/3}\ V^2} = \frac{1.3115\ R}{\Delta^{2/3}\ V^2} \times 1.026 \times \left(\frac{2240}{1.026} \right)^{2/3} \right]$$

This (C) coefficient follows the laws of comparison and would therefore be strictly constant for any size of ship were it not for the fact that the frictional horsepower does not follow these laws.

The frictional resistance varies at something less than the square of the speed, and the coefficient of friction is higher for a short vessel than for a long one. As a consequence, the (C) calculated from the model tests will be greater than for the ship.

Unfortunately doctors differ as to the exact amount of the skin resistances, Froude taking a frictional coefficient for the 20-foot model of 0.01031 and for the 400-foot ship 0.00886 with a speed variation for both model and ship of $V^{1.825}$ (i. e., R for wetted surface $= S \times V^{1.825} \times .00886$).

At Washington the coefficient of friction for the 20-foot model is 0.00969 and for the 400-foot ship it is 0.00910, and the resistance is assumed to vary in the model as $V^{1.854}$ and for the ship as $V^{1.83}$.

The Washington constants for the ship are taken from the works of Tideman who, however, drew all his information from the original experiments of Froude.

The constants for the model in use at Washington were, however, obtained by careful tests at the Washington tank with facilities probably considerably better than Froude originally had at his disposal. It is my opinion, therefore, that by using the Washington model coefficients in conjunction with Froude's ship coefficients the closest possible approximation to the E. H. P. of the ship can be obtained. This will give C values very slightly higher than by Froude's coefficients.

The correction applied to (C) in passing from the model to the ship will of course be the difference in C value for skin friction as calculated by the coefficients for the model and for the ship.

They are therefore a function of the wetted surface and may be most conveniently tabulated for (S) = 1.0.

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A diagram is given herewith showing (1) the value of (C_t) at (S) = 1.0 for a 400-foot ship and (2) the deduction from (C_t) of model for (C_t) of ship with (S) = 1.0 as calculated by using the coefficients of the various authorities for 10-foot and 20-foot models and 400-foot ship. On the same diagram, as an inset, is shown the percentage change in (C_t) value for other lengths of ships.

For greater convenience these values are also tabulated for the usual speed ratios.

(C_t) Differences Passing from Model to 400-foot Ship for (S) = 1.0

V/√L	20-Foot Model			10-Foot Model		
	Froude	Washington	Wash.-Froude	Froude	Ann Arbor	Wash.-Froude
0.40	.0470	.0382	.0418	.0695	.0430	.0650
0.50	.0454	.0375	.0410	.0670	.0442	.0635
0.60	.0440	.0369	.0403	.0650	.0453	.0623
0.70	.0428	.0364	.0398	.0633	.0464	.0612
0.80	.0418	.0359	.0393	.0618	.0471	.0603
0.90	.0410	.0355	.0389	.0605	.0478	.0596
1.00	.0402	.0351	.0385	.0594	.0484	.0589
1.10	.0395	.0348	.0382	.0584	.0489	.0583
1.20	.0389	.0345	.0379	.0575	.0494	.0577
1.30	.0384	.0343	.0376	.0567	.0498	.0572

The work of extension from model to ship may be arranged as shown herewith, the table being self-explanatory in great measure. Column 6 contains the (C) differences as above for (S) = 1.0 and these differences multiplied by (S) value, 6.49, and by a small temperature correction factor 1.017 are tabulated in column 7 and are subtracted from (C) value for model given in column 5 to give (C) for 400-foot ship in column 8. Column 9 is left blank as it is convenient for various purposes such as for tabulating (C) value with Froude or Washington correction.

The (C) correction in passing from one ship to another is of course of the same nature as that for passing from model to ship, and may be calculated from the diagram, but it is so nearly constant for all speeds that it can conveniently be tabulated for a speed ratio of say 0.80 and a value of (S) of say 6.50, thus:

Length	(C) Correction	Length	(C) Correction
100 feet	+ .0877	500 feet	— .0132
200 feet	+ .0406	600 feet	— .0233
300 feet	+ .0173	700 feet	— .0313
		800 feet	— .0398

The data given in the example herewith is for an exceptionally good model, and it is very unusual to have the (C) values below about 0.65. (S) values usually range between 6.0 and 7.0 and depend on draft ratio and (M) value to a considerable extent.

The draft ratio δ used expresses the ratio of depth of the rectangle of ship's breadth and mid area to that breadth.

What the Shipping Bill Is and Does

(*Continued from page* 606)

traveling at public expense, and all government supplies must be carried in American vessels wherever practicable.

Further paragraphs of the new bill define in some regards the relation of railroads and steamships. The provision of section 28 of the Merchant Marine Act of 1920, not yet enforced, requiring that goods for export and import enjoying preferential rates on American railroads, shall be conveyed in American ships, is clarified in some particulars.

National aid under contract will endure at least 10 years, as this is stipulated as the contract period.

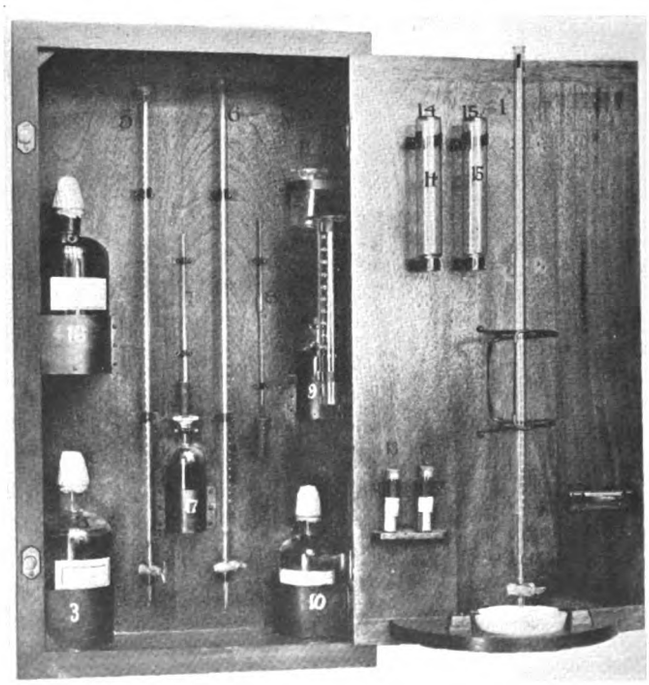
Cost of New Shipping Bill

But what will the new shipping bill cost year by year? Not more than $15,000,000 in total compensation the first year, is the estimate of experts of the Shipping Board, and not more than $40,000,000 a year at its maximum some years hence, when a merchant marine of 7,500,000 tons gross register, capable of carrying from 50 to 60 percent of our own exports and imports, has been properly developed in the foreign trade.

At present the Shipping Board reports a loss of nearly $50,000,000 a year on its 450 ships in operation. Considering both indirect and direct aids, including the deductions from income taxes, it is a just estimate that the cost of the bill at its highest figure will be kept well within $50,000,000. Moreover, it should be borne in mind that the upbuilding of a great merchant marine will produce increased income taxes from shipowners, employment for labor, and an expansion of our export trade, thus creating additional sources of public revenue. Still further, it is an axiom that private control and operation of our merchant ships are far more economical than government ownership and operation—even when the government experiment is being tried under the happiest of auspices.

Set for Testing the Alkalinity of Boiler Feed Water

A PRECISION feed water testing set, for which the makers, the Precision Water Treating Company, Brooklyn, N. Y., claim an accuracy in determining alkalinity to 1/10 of one percent and salt contained to 1/10 of one grain per gallon, has recently been made available to stationary power plant and marine boiler uses. In marine



Precision Feed Water Testing Set

work especially it is vitally important that the salt content of the feed water be under constant check, so that leaks in the condensers, pump lines, distillers and boilers may be determined at their inception.

It is also desirable to maintain water at the proper degree of alkalinity to prevent scaling and corrosion with resultant savings in fuel and lengthened periods of service between cleanings. The precision water testing apparatus is designed to perform convenient and accurate determinations in a quantitative manner. Demonstrations are made at the office of S. Aitken, agent of the company, Room F, 11 Broadway, New York.

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International Shipping Conference Committee Reports

At the International Shipping Conference held in London last November committees were appointed to investigate exhaustively many of the questions discussed at the conference. As a result the following committee reports have been submitted to the president of the conference covering the subjects of Life-Saving Appliances, Wireless Telegraphy, Load Lines and the Subdivision of Passenger Liners.

Life-Saving Appliances

THE Committee was appointed under a resolution of the International Shipping Conference, passed in November, 1921, which defined the principles upon which any further consideration of that part of the problem of Safety of Life at Sea which more particularly relates to Life-Saving Appliances should be based. The first meeting was held in London on May 22; it was agreed that the Convention of London, 1914, should be taken as the basis of discussion, bearing in mind the principles underlying the report of the Merchant Shipping Advisory Committee, 1912. In the committee's opinion, a cardinal error was committed by the Government's signatory to this Convention in departing from the principles contained in this report and in substituting therefor other principles which failed in any degree commensurate with the anticipation of such Governments to save life after marine casualties.

To the main recommendations of that committee the International Shipping Conference adhered in their resolution of November, 1921, and with the disaster of the *Egypt* fresh in the committee's minds, it urges them upon our Governments.

Among the resolutions passed were: That the attention of the Board of Trade be drawn to the *Egypt* disaster and to the fact that the opinions expressed at the International Conference are thereby confirmed as follows:

(i) The Board of Trade referred, after the loss of the *Titanic*, the whole question of boats and life-saving appliances to the Merchant Shipping Advisory Committee.
(ii) That committee reported in favor of certain principles being adopted by the Board of Trade.
(iii) Had these recommendations been fully acted upon, subsequent experience under conditions both of war and of peace shows that loss of life at sea might have been diminished.
(iv) Nevertheless, the Government's signatory to the Convention of London proceeded upon other principles which shipowners then feared and which have proved to be detrimental to safety of life at sea.

That all Governments be accordingly invited to take immediate steps to revise the Convention in accordance with the Report of the Merchant Shipping Advisory Committee, 1912, as amplified by the recommendations of the committees of the International Shipping Conference concerned with safety of life at sea.

Wireless Telegraphy

(*a*) Amendments to the Convention of London

After consideration of the Articles of the Convention of London relating to wireless telegraphy, and having taken into account memoranda submitted on behalf of the German and Italian delegates, the committee recommends the following amendments:

Article 32.—It was agreed—

1. That in order to allow for partial as well as total exemption of coasting and short sea trade vessels, the opening sentence of the second paragraph of Article 32 should be amended.

2. That paragraph 2 (sub-section 1) should be amended by the substitution of the words "200 sea miles from the nearest coast" for the words "150 sea miles from the nearest coast."

Article 34.—It was agreed that the following words be added to Article 34 after the words "High Contracting parties" in the last paragraph but two:

"An automatic calling apparatus shall be deemed efficient if it can take the distress signal and the safety signal and reaches 80 percent efficiency in an open sea test under service conditions.

"The shipowner may employ a navigating officer or other member of the crew in lieu of a wireless operator, provided such person has qualified for a special certificate of competence to receive and transmit wireless signals in connection with safety of life at sea. Such person shall not be required to keep any specified watch on the wireless instruments, provided that he is always available in the case of emergency and that the continuous watch when required by the Convention is kept by automatic or human agency."

Article 35.—It was agreed that the first paragraph of this Article should be altered to read as follows:

"The Radio Telegraphic Installation required by Article 31 above shall be capable of transmitting clearly perceptible signals for the purpose of safety of life at sea from ship to ship over a range of at least 100 sea miles by day under normal conditions and circumstances."

(*b*) General Recommendations

1. *Basis of obligation to carry Wireless.*—We have considered this question, and find that the basis provided in Article 31 of the Convention is logical and satisfactory; this number should refer to those actually on board, in accordance with the Convention, and not to the number of those for whom the ship may be certificated.

2. In the event of the Government of any State signatory to the Convention exercising the powers of Article 32 in the sense of differentiating between passenger and cargo vessels under sub-section 1, we recommend that the obligation to carry wireless shall not in any event be placed upon passenger vessels unless they have 100 passengers on board.

3. *Automatic device.*—The most immediate need in connection with the use of wireless is the development and approval of an automatic device. Some doubt, however, having been raised on the committee as to whether the apparatus in its present form was sufficiently developed to allow of its early or immediate adoption, they invited technical representatives of the different wireless companies in Great Britain to give evidence on this point. Evidence was accordingly received from Commander A. J. Slee, representing the Marconi Company, and from Mr. R. Ferguson, on behalf of the Radio Communication Company. Mr. H. Machin, manager of Siemens Bros., Limited, was unable to attend, but he has since told the committee that, while he believes it to be impossible for an automatic device to record the existing S.O.S. signal, he hopes that with an altered distress signal an effective automatic device could be put on the market.

The representatives of the Marconi and Radio Communication Companies stated that, if the alarm call were altered, there would be no difficulty in providing an apparatus to take such altered signal with an even greater percentage of efficiency than that of an instrument described.

It is not reasonable, however, to expect wireless companies to submit for trial or embark upon the manufacture of these instruments until the conditions of their trial and acceptance by the authorities have been definitely laid down.

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It was accordingly resolved:

(a) That the Governments of the various maritime States be urged again to apply themselves to the immediate approval of an automatic device to receive emergency calls.

(b) That with this object the purpose which such instrument is required to meet should be restricted to the taking of emergency calls under ordinary service conditions at sea; and

(c) That existing devices should at once be re-tested under the same service conditions with the object, if possible, of approving immediately a device which will respond under normal service conditions at sea to the existing distress call, *but that if this is not possible, active steps should be forthwith taken to agree internationally on a new distress call which is capable of being so taken.*

4. *Wireless as a Navigational Duty.*—The committee recommends that apprentices should be trained in wireless, as in navigation, and that existing masters and navigating officers should be encouraged to take a wireless course to secure their certificates, and that each Government should institute a special examination and certificate of competence to operate the instrument for ship's service, including safety of life at sea.

5. *Directional Wireless.*—The committee attaches the greatest importance to the development of this branch of wireless telegraphy, but thinks it necessary to point out that a navigational instrument which will add to the safety and decrease the cost of running ships is of such commercial importance, that shipowners may without risk be left to choose their own time and method for its adoption, and that the fewer Government regulations that are applied to it the more satisfactory and the swifter will be its development. In the same way they desire to encourage shipowners to make use of wireless for the receipt of time and weather signals, but are strongly of opinion that this is a point upon which Government interference would be quite inappropriate.

Life-Saving Appliances

It was reported that the British Government had again remitted to the Merchant Shipping Advisory Committee of the Board of Trade the question of life-saving appliances, with an instruction to revise the appropriate sections of the Convention of London in accordance with more recent experience. On this subject, the Committee states: "We have already stated our opinion that the principles enunciated by this Committee, which were reached in 1912, were sound, and that every successive failure of the regulations adopted by the various Governments in contradiction of their report has only served to confirm the wisdom of their first decisions. We here desire to express the hope that the Merchant Shipping Advisory Committee will reaffirm the principles then established, as amplified in the terms of the resolution passed by the International Shipping Conference, and which it has been our task further to interpret. In particular, we endorse the principle that boats in excess of those which can readily be launched are an encumbrance and a danger, and that in a disaster many lives may be saved by light and handy buoyant apparatus.

"Since the *Titanic* a series of disasters at sea proves the danger of encumbering the decks with boats which cannot be launched, and the need for buoyant apparatus which can easily be handled or will float off when the ship sinks and give support till rescue comes.

"These general principles have been translated into specific recommendations for the amendment of the Convention by our technical sub-committee in their report, which we attach, and unanimously commend to the Conference.

"We desire to re-affirm the Resolution of the International Conference:

"'That inasmuch as International Conventions become valueless, if any contracting Government applies different rules, whether less or more severe, to all ships visiting her ports, the attention of Governments signatory to the Convention should at once be called to instances in which the international accord of the Convention has been disturbed by particular regulations in order that the disturbance may be removed.'"

The reports are signed by the following: A. G. Anderson (chairman), Great Britain; Chas. A. Bartlett, Great Britain; Ing. E. Benvenuti, Italy; David Boyd, Great Britain; Jas. Carnegie, Belgium; E. Falcoz, France; H. Garde, Denmark; John R. Hobhouse, Great Britain; O. A. Nordborg, Sweden; W. H. J. Oderwald, Holland; N. Ohtani, Japan; I. Hysing Olsen, Norway; L. Peskett, Great Britain; Alejandro de la Sota, Spain; Warnholtz, Germany; J. Rypperda Wierdsma, Holland; P. Maurice Hill (secretary), Great Britain.

International Load Line

The International Shipping Conference, held in London on November 23, 24 and 25, 1921, passed the following resolution:

"That this conference, representative of the shipping industry in every part of the world, is of the opinion that the time is opportune for the introduction of International Load Line Regulations.

"That with this object a committee be appointed to investigate and determine the form of regulations capable of International acceptance.

"That such committee consist of one member appointed by representatives of each country, and that the registration bureaus and the classification societies be invited each to appoint a representative on the committee, and that the committee appoint a secretary."

In accordance with the terms of reference as shown above, the committee held its first meeting on May 22, 1922.

It was agreed that the Report No. 10, which had been submitted to the International Shipping Conference in November of last year, should be taken as the basis of discussion, together with the Memoranda received from other countries, namely: (1) Scandinavia, dated Copenhagen, April 25, 1922; (2) Germany, dated April 26, 1922; (3) Holland, dated April 24, 1922; (4) Holland, undated; (5) Japan, dated May 16, 1922.

In the course of general discussion, it was recognized that the question of allowance for freeboard for certain classes of superstructure was closely associated with the question of tonnage measurement, and that certain anomalies in the assignment of freeboard had arisen on account of the preferential treatment of spaces exempted from tonnage measurement. It was recognized, however, that this question of tonnage was affected by the action of Port Authorities and others, and it is necessary for a general agreement to be arrived at.

Enclosed Spaces

As regards the question of freeboard assignment, it was recognized that if a space was totally enclosed, it should have a full allowance for freeboard, and that otherwise the allowance for freeboard should be varied in respect of the means of closing adopted.

Discussion also took place on the basic tables of freeboard, and the general opinion was that the freeboard at present required for the usual type of vessels was satisfactory, and that, as regards small vessels of usual type, no increase of freeboard appeared necessary.

It was felt that the present freeboards of flush deck vessels required some increase, and it seemed to be generally agreed that all flush deck vessels should be provided with a forecastle or, alternatively, if this were not done, there should be a greater increase of freeboard. This increase of freeboard forward might perhaps be obtained by the adoption of suitable sheer.

Particular attention was directed to the standard of strength proposed by the load line committee, and it was observed that in the Japanese regulations on load line recently issued, the load line standard had been adopted with only slight modification. Opinion was divided on the question, some of

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the delegates being in favor of the adoption of the proposed standard, others considering that the recognized authorities should set up suitable standards.

The conditions of assignment of freeboard, as proposed by the load line committee, were considered at some length. The committee was satisfied that the greater part of these conditions had already been adopted by the action of the classification societies, and that it would be preferable at the present time to confine their attention to the main points of the freeboard question rather than to detail the points involved in these clauses.

WOOD DECK CARGOES

Reference was made to the determination of freeboard for vessels carrying wood deck cargoes, and attention was drawn to the recent report of the deck cargoes committee of the International Shipping Conference on this subject. It was observed that this report did not agree with the observations of the load line committee on this question, and that the rules already proposed in the report referred to provide for the assignment of freeboard for vessels carrying such cargoes by allowances based on the freeboard regulations for a steel steamer.

This committee, in common with the previous committees on subdivision and on deck cargoes, experienced difficulty in regard to variations of freeboard permitted for different seasons of the year and for different geographical regions. They confirmed the opinion already expressed by the other committees that it was very necessary that the Governments of maritime countries should take common action to define the summer and winter season, not only for the North Atlantic region, but also for other regions of the globe where similar treatment might be suitably and safely granted.

It is to be observed that when this question of regional variation is under discussion, special regard should be paid to certain waters, which might be regarded as inland seas, such, for example, as the Baltic, which is sometimes regarded as suitable for favored terms in respect of maritime legislation.

NOT RETROSPECTIVE

The committee was agreed that the application of those rules would only affect the freeboard of ships *to be* built, and that the proposals should not be made compulsory retrospective to vessels already in existence. They were further of opinion that these rules were framed for international ocean-going trade.

It was observed that the rules proposed by the load line committee did not make provision for the assignment of freeboards to vessels of exceptional types or forms, and it is presumed that some special schedule of requirements in regard to such vessels would need to be laid down at a future date.

The committee then proceeded to deal in detail with the report of the load line committee, and, in regard to the question of stability, were of opinion that it was only necessary to state that the assigning of a freeboard mark did not give any guarantee as regards the stability of a vessel. The clause that requires a master to exercise authority in this respect should, therefore, be deleted. There was, however, an opinion expressed that certain countries might find it desirable to retain this clause or to substitute for it any other that conformed with the law of the country.

The definition of freeboard and the methods of marking were generally agreed to.

The definitions of standard types of vessels and of the principal dimensions were generally concurred in, except that some opinion was expressed that it was desirable in all these technical regulations to have a uniform definition of length. The committee was of opinion that in vessels with cruiser sterns, the length should be taken to the center of the rudder stock, or to 96 percent of the total length overall, whichever was the greater, subject, however, to a reservation on the part of the Norske Veritas and the Technical Adviser for Denmark as to this altered reading.

The characteristics of standard vessels were next considered, and the ratio of length to freeboard depth and standard round of beam were agreed to, and the bases of the table for determination of freeboards (Article 8) were also concurred in.

The committee proceeded with the discussion of the correction to be made to the freeboards for departures from the standard, and were generally in agreement with the corrections necessary for the variation of length to depth ratio for sheer correction, and for round of beam correction. The question of immersion of the freeboard deck, as contained in Article 16 of the load line committee's report, met with the approval of the committee.

STANDARD HEIGHT OF SUPERSTRUCTURES

The question of the standard height of superstructure was discussed by the technical sub-committee, and it was agreed that:

The last clause of Article 7 (D) of the load line committee's report should be amended to read as follows:

(a) The standard height in feet of superstructures which are fitted abaft amidships is 3 feet when the length of the vessel does not exceed 100 feet and 5 feet when the length of vessel is 350 feet and above.

(b) The standard height in feet of superstructures which are fitted forward of amidships is 5 feet when the length of the vessel does not exceed 100 feet and 7 feet 6 inches when the length of the vessel is 350 feet and above.

(c) For intermediate lengths the standard height is to be obtained by interpolation.

This recommendation sets up a standard height for after superstructures, as well as for forward superstructures.

The sub-committee also considered the most important subject of the basic freeboard tables, as contained in the appendix to the load line committee's report. The committee was generally in agreement with those tables for flush deck vessels, but the representative of the Norske Veritas considered that the freeboard should be larger for such vessels.

Considerable discussion necessarily arose on Article 13 of the load line committee's report, dealing with the allowance to be granted for superstructures with various types of closing apparatus, and the committee was of opinion that the allowances, as contained in Table 2 of the load line committee's report, should be modified in accordance with the following recommendations:

In regard to the question of closing appliances, it was agreed that 100 percent allowance should be given to shelter deck vessels with a tonnage opening closed with closing appliances (storm boards full height), fitted at each end of the tonnage well. It was agreed that full allowance should be given for bridge houses which were closed by Class 1 appliances at the fore end, and either Class 1 or Class 2 appliances at the after end, in conjunction with open scuppers. In the case of a combined poop and bridge, it was agreed that the full allowance should only be given when the openings, if any, were closed with Class 1 appliances. Portable plates, whether secured by bolts through the bulkhead plating, or by hook bolts, should be included in Class 2 closing appliances, but that storm boards of half height should be regarded as non-existent.

STANDARD SHEER

The question of a standard sheer was investigated, and the recommendations of the load line committee were agreed to, subject to a reservation on the part of one of the Dutch representatives. The Norwegian and Swedish representatives also made a reservation in regard to the case of shelter deck vessels having a tonnage opening aft, and were of the opinion that in such cases the sheer should be measured relative to the shelter deck and not to the upper deck.

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The committee had under consideration the modifications which could be made to the regulations for the assignment of freeboard for wood and composite vessels, and they recommend that:

(1) The length shall be measured in the same manner as for a steel vessel.
(2) The breadth shall be measured to the outside of the planking amidships instead of the outside of the frame amidships.
(3) The freeboard depth to be used with the Tables is the vertical distance amidships from the point where a continuation outwards of the upper surface of the freeboard deck intersects the outer surface of the shell or planking to the level of the top of the keel in steel and iron vessels, and to the lower edge of the rabbet of the keel in wood and composite vessels. When the form of the lower part of the midship section is of a hollow character, the depth is, however, to be measured to the point where the line of the flat of the bottom continued inwards cuts the side of the keel. When the rise of the floor exceeds 1½ inches per foot of a half breadth, the freeboard depth may be reduced by half the difference between the total rise of floor at the half breadth and the total rise at the standard rate of 1½ inches per foot. Two and a half inches per foot of half breadth is, however, to be the maximum rate of rise on which an allowance is to be made.

The committee was also of the opinion that this definition of depth might with advantage be substituted for the definition given in Article 6 (c) of the load line committee's report.

It was agreed that the computation of the freeboard of sailing vessels should be in accordance with the rules for steamers, such an addition being made as would bring the assignment into practical agreement with the present summer freeboards for such vessels. The summer and winter marks could be retained as at present.

Non-propelling barges should be treated on the same basis as that laid down for sailing vessels.

The committee was very much exercised with the definition of the term "steamer," as contained in Article 1 (A) of the load line committee's report. They were of the opinion that consideration should be given to the question of speed and power, and suggest that some minimum brake horsepower should be associated with the load displacement of the vessel. It was not possible at present to determine a satisfactory standard, but it is recommended that this subject be left over for further study.

The report was signed by the following: Belgium, Christian Sheid; Denmark, J. A. Koerbing; France, E. Patry; Germany, Warnholtz; Great Britain, Walter J. Chambers and H. B. Hooper; Holland, W. Royer; Italy, C. Camalich; Japan, W. Yokoyama; Norway, Halfdan Ditlev-Simonsen; Spain, Alejandro de la Sota (for Bilbao Shipowners' Association); Sweden, O. A. Nordborg; for Bureau Veritas, E. Patry; for Det Norske Veritas, J. Bruhn; for the British Corporation, Benson Taylor; for Lloyd's Register, W. S. Abell.

The Subdivision of Passenger Liners

The International Shipping Conference, held in London on November 23, 24 and 25, 1921, passed the following resolutions:

(1) That international uniformity in regulations for the subdivision of passenger vessels is necessary.
(2) That the International Code of Regulations contained in the Convention of London is incomplete, unsatisfactory and demands immediate revision.
(3) That any revision of the Convention must be such as to secure effective administration of the regulations by all the signatories, to the end that certificates of safety may have international validity.
(4) That any revision of the Convention must have regard, in conformity with Article 17, to the nature of the services in which the vessels are engaged and must be consonant with the economic conditions under which they are operated.
(5) That a committee of the Conference shall be appointed to consider and report in due course on the manner in which the Convention should be modified.

In accordance with the terms of reference contained in the last of these resolutions, the committee held its first meeting on May 8.

It was agreed that the Report 11A, which had been submitted to the International Shipping Conference in November of last year, together with the letter of December 14, 1921, and the memorandum dated April, 1922, should form the basis of discussion. (See Appendices.)

The Factorial System Preferred

On the relative merits of the graduated and factorial systems for regulating the spacing of bulkheads, it was agreed—

(a) That the factorial method should be adhered to, especially in view of the fact that such procedure would accord with the attitude already taken up by various Governments and would therefore facilitate final agreement.
(b) That below a certain length of vessel it was not economically possible to provide a one-compartment standard of subdivision throughout the length.
(c) That greater simplicity and directness of method for flooding calculation was desirable, and that a code or codes might advantageously be adopted from which floodable length curve, draft penalty, and index of permeability could be derived, provided that the codes used by different countries were guaranteed to give results differing by not more than 2 to 3 percent, and provided that shipowners had the option of employing a method involving the use of first principles in the calculations.
(d) That a criterion, based on mean permeability of all spaces, as suggested by the bulkheads committee was unacceptable.
(e) That provision in cargo carrying vessels must be made for a minimum length of hold, but as to the precise minimum there was some difference of opinion; the German delegation stating that the economic requirements of their mercantile marine did not call for a length of main hold as much as 80 feet.

At the conclusion of this general discussion the committee adjourned after appointing a technical sub-committee. This sub-committee held four sessions, and on May 12 presented its report to the plenary committee. At the same time a letter was received by the chairman from Mons. Nizery stating that the French delegates, who had attended all the meetings up to May 12, could no longer collaborate in the work of the committee.

Recommendations

The recommendations or findings adopted either absolutely or with reservations as recorded in this report fall into two parts.

I. Those adopted when representatives of all the delegations were present.

II. Those adopted when representatives of all the delegations, excepting only the French, were present.

They are:

Part I

(1) That in vessels below a certain length it is not possible, consistently with their economic use, to space the bulkheads so closely that the vessel will float with any one compartment open to the sea.

(2) That greater simplicity and directness of method for flooding calculations is desirable, and that a code or codes, including that recommended by the British bulkheads committee, without correction for form, might advantageously be employed from which floodable length curve, draft penalty and index of permeability could be derived, always provided that the codes used by different countries were guaranteed to give results differing by not more than 2 percent to 3 percent from an agreed standard, and provided that shipowners had the option of employing a method involving the use of first principles in the calculations.

(3) That the factorial method for regulating the spacing of bulkheads should be adhered to, especially in view of the fact that such procedure being in accord with the attitude already adopted by various Governments would facilitate final agreement.

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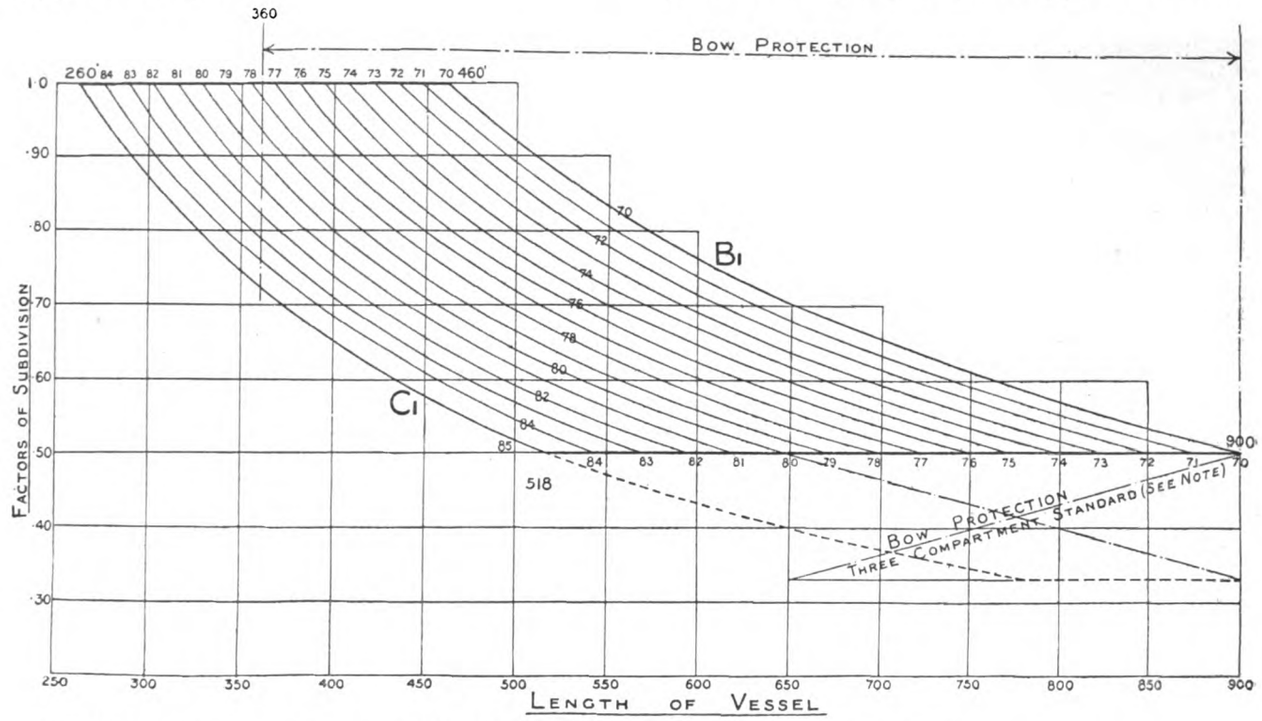
(4) That a criterion of service based on the mean permeability of all spaces included in the gross tonnage as suggested by the bulkheads committee is unacceptable.

(5) That in vessels carrying mainly cargo with a nominal number of passengers, whether above or below the bulkhead deck, provision must be made for a hold of a minimum length, but opinion as to the precise minimum was not unanimous, the German delegation considering that 80 feet, the minimum suggested by the British delegates, was in excess of the requirements of their own trade.

(6) That the curve *B*, as given in Report IIA is acceptable as satisfying both safety and economic requirements. (This is subject to the reservations by the German and Japanese delegations.)



1. This diagram does not apply to vessels in the "Home and Coastal" services having length below 360 feet.
2. Vessels with criterion permeability values of 70 percent or below, to have factors of subdivision derived from curve B1.
3. Vessels with criterion permeability value of 85 percent and above to have factors of subdivision derived from curve C1.
4. Vessels with criterion permeability values between 70 and 85 percent to have factors of subdivision obtained by direct interpolation from the diagram.
5. All vessels 360 feet and above to have bow protection of either a "two" or "three-compartment" standard, and the remainder of the vessel will in no case exceed a "two-compartment" standard.
6. Vessels of 360 feet in length, with criterion values less than given by formula: $u = 104.5 - \frac{L}{13.3}$ to have "two-compartment" bow protection only.
7. Vessels of 360 to 460 feet in length, with criterion values equal to or greater than given by formula: $u = 104.5 - \frac{L}{13.3}$ to have "two-compartment" bow protection, with the remainder of vessel to diagram.
8. Vessels of 460 feet in length and above, to have "two-compartment" bow protection with remainder of vessel to diagram, except in vessels 650 feet and above, with criterion values equal to or greater than given by formula: $u = 105.4 - \frac{L}{25.4}$ where the bow protection will be of a "three-compartment" standard and the remainder of vessel a "two-compartment" standard.
9. A "two-compartment" bow protection signifies that the length of fore-peak and No. 1 hold will together not exceed the floodable length forward.
10. A "three-compartment" bow protection signifies that the length of fore-peak and Nos. 1 and 2 holds will together not exceed the floodable length forward.

Diagram of Factors of Subdivision for Foreign-Going Passenger Vessels

(7) That the curve *C* as laid down in the Convention should be adhered to for vessels up to 550 feet in length, the curve being then limited by a horizontal line drawn at 0.45 factor of subdivision, as shown in Appendix *J*.

(8) That when in any vessel a factor of subdivision of 0.40 or less is complied with, a special mark should be placed on the Safety Certificate to this effect.

(9) That the proposals contained in the Report IIA for special bow protection are satisfactory.

FACTORS OF SUBDIVISION

(10) That the curve *B* is applicable to vessels carrying mainly cargo with a nominal number of passengers, whether the same are carried above or below the bulkhead deck.

(11) That the Convention curve *C* as amended is applicable to the highest type of vessel primarily engaged in the carriage of passengers.

(12) That the main factor of the criterion might reasonably be based on the permeability of the vessel below the bulkhead deck.

(13) That in addition it would be necessary to introduce a correcting factor based on the total number of passengers carried in the vessel, whether below or above the bulkhead deck, in order to provide for the varied distribution of passengers and of space per passenger.

(14) That this factor might be derived from some specific volume per passenger so applied that where the volume of the space set apart for passengers below the bulkhead deck is greater than the product of the total number of passengers on board multiplied by some specific volume per passenger, the criterion could be applied without correction, but that where the total number of passengers multiplied by some specific volume per passenger exceeds the volume of the space set apart for passengers below the bulkhead deck such greater volume should, for purposes of the criterion, be substituted for the lesser volume.

Note.—The French delegation expressed their dissent from Recommendations 12, 13 and 14.

The Norwegian delegation desired further opportunity to test the practical application before concurring.

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(15) That Articles 2 and 3 of the Convention should be read to mean that any ship which was not at any point in her voyage at a distance of more than 200 sea miles from a sea coast might be exempted from the provisions of the Convention.

Part II

(16) That as a provisional basis for further study the nominal number of passengers to be associated with curve B_1 should be $\frac{L^2}{1{,}000}$, where L is the length of the vessel in feet, and that, if possible, this allowance should be embodied in the scale factor of the criterion.

(17) That subject to international agreement on seasonal limits, the subdivision load line should be subject to seasonal variations, these being dealt with as proposed in the International Committee's Report in connection with deck cargoes.

Determination of Permeability

(18) That the British suggestion for the determination of permeability contained in Appendix VII was satisfactory and should be accepted, but that the passage commencing line 6 should read as follows:

"Where h = the mean depth below the bulkhead deck of the 95 percent spaces as defined in the present Board of Trade Regulations (exclusive of double bottom, peaks and tunnels) reduced in the proportion which the mean length of such spaces bears to the *mean* length of the vessel measured between the forward machinery space bulkhead and the collision bulkhead, or between the *mean* position of the aft machinery space bulkhead and the *mean* position of the after peak bulkhead. The mean depth is to be measured from top of deck to top of deck at center line.

H = the depth of the vessel from the top of keel to the margin line midway between the end of the machinery space and the forward or after end of the vessel.

$c = o$ for forward end, 1 for after end in single-screw vessels, and 2 for after end in twin-screw vessels, *and 3 for triple-screw vessels.*"

(19) That the mean length of any compartment should not exceed the permissible length, and that no compartment having a mean length of less than 25 feet should be considered as forming part of the watertight subdivision of the vessel.

(20) That more than two alternative load lines should be permitted.

(21) That Article IX (1) of the Convention should be amended to read as follows:

"When the factor of subdivision is equal to or less than .5 it may be doubled in order to give at any point of the ship's length the total length of two adjacent compartments; but, in that case, the length of the shorter compartment of any pair should not be less than one-quarter of the total length *of the two adjacent compartments.*"

Steps and Recesses

(22) That the Regulations for steps and recesses as contained in the Convention should be amended to read as follows:

Recesses.

"That no part of the sides of the recesses should be nearer to the side of the ship than 6 feet, or one-sixth of the breadth, whichever is the greater."

Steps.

"That, whatever the factor of subdivision, the total length of the step in any bulkhead should not exceed 2 percent of the ship's length, but that where the factor of subdivision is .5 or less, the length of the steps may be increased by 3 m., or 10 feet."

The report was signed by the following: Thos. Free, Australasia; A. Leenaers, Belgium; A. S. M. Nicholls, Canada; J. A. Koerbing, Denmark; A. M. Nizery, France; M. Warnholtz, Germany; Kenneth S. Anderson, Great Britain; W. J. Oderwald, Holland; E. Benvenuti, Italy; N. Ohtani, Japan; J. Bruhn, Norway; Michael J. Hayes, Spain; Dan Broström, Sweden.

Appendix VII

Determination of Permeability

It is proposed (somewhat as suggested by the Board of Trade in their Memorandum M. 30084) that the average permeability of the hold spaces below the bulkhead deck should be determined by the formula—

$$\text{Permeability} = 63 + 32\frac{h}{H} + c.$$

Where h = the mean depth below the bulkhead deck of the 95 percent spaces, as defined in the present Board of Trade Regulations (exclusive of double bottom, peaks and tunnels), reduced in the proportion which the mean length of such spaces bears to the length of the vessel measured between the forward machinery space bulkhead and the collision bulkhead, or between the aft machinery space bulkhead and the after peak bulkhead. The mean depth is to be measured from top of deck to top of deck at center line.

H = the depth of the vessel from the top of keel to the margin line midway between the end of the machinery space and the forward or after end of the vessel.

$c = 0$ for forward end, 1 for after end in single-screw vessels, and 2 for after end in twin-screw vessels.

The permeability of machinery spaces is to be taken at 80 percent for steamships and 85 percent for ships fitted with internal combustion engines.

In cases where the "two-compartment" standard of subdivision is required and the permeabilities of two adjacent compartments are different, the length of the compartments are to be obtained by the formula—

$$\frac{u_1}{u_2}(l - l_1)$$

as given in paragraph 18 of the Board of Trade present regulations for the construction of passenger vessels.

Appendix B

The Criterion of Service referred to in paragraphs 35, 38 and 40, in the marginal note on the factor of subdivision diagram, Appendix VIII of the Chamber of Shipping Technical Sub-Committee Report (11A), and explained in the circular letter, dated December 14, 1921, is as follows:

$$u = u_1 + P,$$

where

u = Criterion of Service permeability.

u_1 = the mean permeability of spaces below the bulkhead deck (derived from formula from the longitudinal middle line section of the vessel). (See Appendix A.)

P = a correction for the passenger capacity above the bulkhead deck.

A suitable evaluation of the last term in the equation was found to be—

$$P = \frac{150{,}000\ N}{L^2 B}$$

where

N = number of passengers accommodated above the bulkhead deck.

L = subdivision length of vessel.

B = subdivision breadth of vessel.

The complete formula, therefore, for Criterion of Service may thus be expressed:

$$u = u_1 + \frac{150{,}000\ N}{L^2 B}$$

Appendix C

Memorandum Circulated to the Members of the International Committee on Subdivision of Passenger Vessels in April, 1922, for the Meeting of the Committee Held in May, 1922.

It is anticipated that the committee will, in the first instance, proceed to a general discussion of the Report of the Technical Sub-Committee of the Chamber of Shipping dealing with the subdivision of passenger vessels (11A), which was handed to the representatives of the various countries at the preliminary meeting held on November 25, 1921.

After such general discussion, it is suggested that the following specific questions involved in the Report should be considered:

(1) Whether the general nature of the curve C_1 contained in the Report is acceptable for the highest type of vessels primarily engaged in the carriage of passengers.

It should be observed that curve C_1 is almost identical with the curve C recommended by the bulkheads committee, which has

(*Continued on page 656*)

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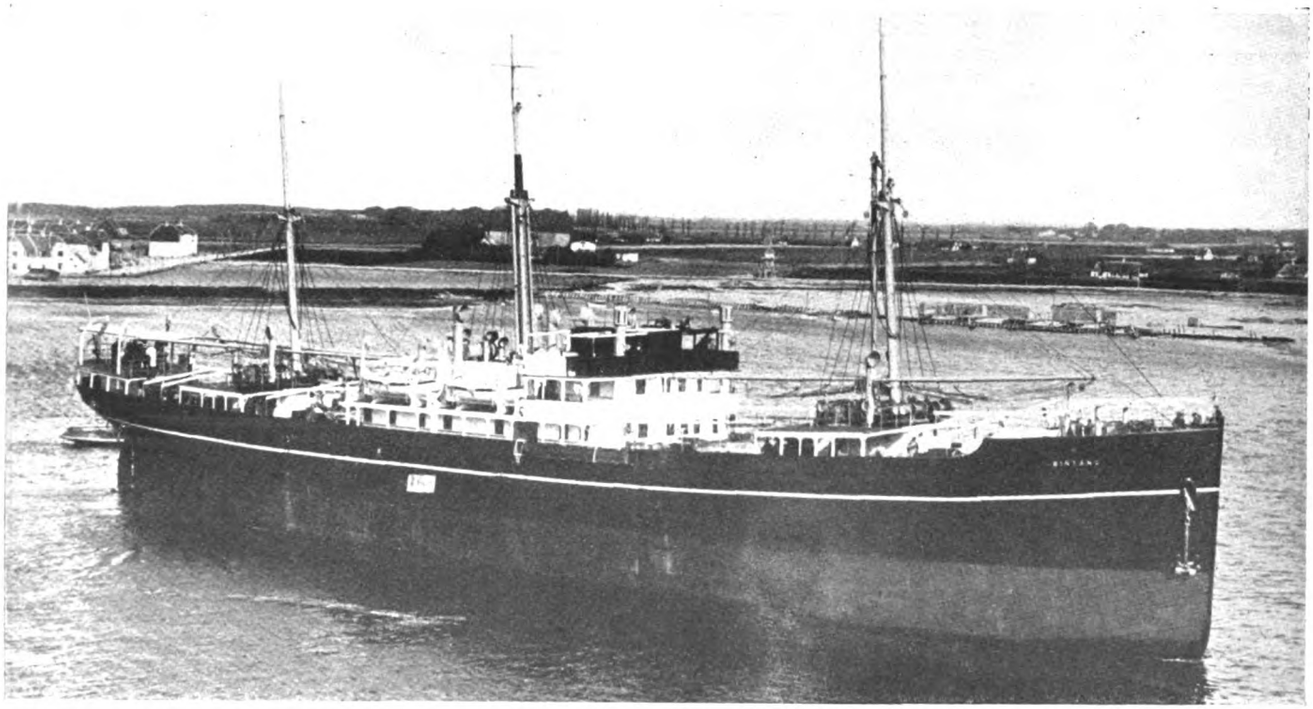


Motorship Bintang, Owned by the East Asiatic Company

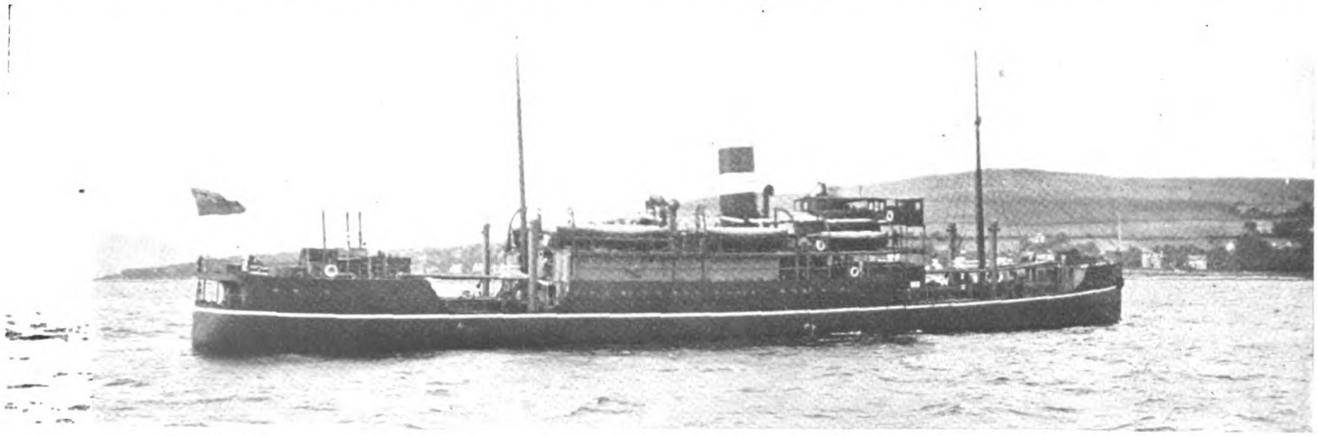
Small Motor Cargo Ships for the Eastern Trade

Motorships of About 2,000 Tons Capacity Equipped with Twin Screw Propelling Machinery—Auxiliaries Are Electrically Driven

By Our Special London Correspondent

WHILE chief interest in European shipping circles has lately centered around the numerous motorships of comparatively large size that have been turned out, varying mainly from 6,000 tons to 14,000 tons deadweight, the problem of the application of the oil engine to smaller vessels for specialized services has not been overlooked. In the opinion of many operators, there is a particularly wide field for this class of craft, on account of the low fuel consumption of the Diesel engine, which permits of a large radius of action without the fuel bunkers occupying too large a portion of the available space on the ship, as may be the case with small steamers trading on long routes. In some of these vessels, perhaps the majority, single screw machinery of the long stroke type has been installed, since the power required seldom exceeds 1,000 shaft horsepower. Probably the tendency will be increasingly in this direction, but it is noteworthy that two interesting small motorships, which have just been completed, are both equipped with twin screw plants, although the power does not exceed that stated above.

These two vessels are both destined for service in the East and will not return to European ports except for periodical survey. It is a proof of the confidence which shipowners now place in the oil engine, that such ships are allowed to



Twin Screw Motorship Dumra, Built for the British India Steam Navigation Company

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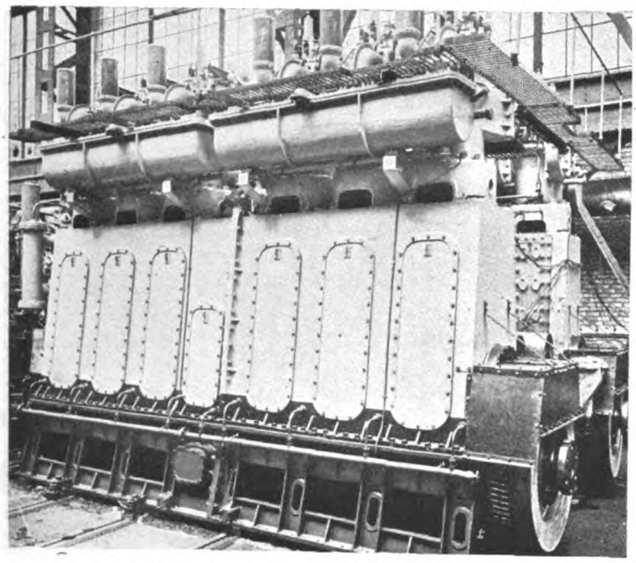


One of the 500 Brake Horsepower Diesel Engines Installed in the Dumra

proceed to their destination immediately after the trials, and will trade for several years on end in parts of the world where possibilities of repairs being effected to the machinery are extremely small.

VESSEL FOR EASTERN COASTAL SERVICE

One of these new motorships was built in Denmark, to the order of the East Asiatic Company, whose fleet now consists almost entirely of oil engined vessels. The *Bintang,* as she is named, is intended for coastal service in the East, and is 284 feet in length, having a beam of 44 feet and a depth of 28 feet.

She is equipped with two six-cylinder Diesel engines of the Burmeister & Wain type, with cylinders 19¾ inches bore, and 26 inches stroke. Each develops about 700 indicated horsepower, or 525 brake horsepower, when running at about 150 revolutions per minute, and the design is practically identical with that of the larger Burmeister & Wain engines, built in sizes up to 3,200 indicated horsepower. Although there is much to be said for the propulsion of ships of this size, by single screw machinery, it is claimed that owing to the higher speed of revolution possible with a twin screw plant, such an arrangement allows of an actual reduction of machinery weight, as compared with the single screw ship. On the other hand a marine engineer naturally prefers machinery operating at low speed, while the advantage of having only six cylinders in a ship instead of twelve is self-evident.

The *Bintang*, as is usual on most modern oil engine vessels, is equipped with electrical auxiliary machinery, two Diesel driven generating sets being located in the engine room. The exhaust gases are discharged through pipes alongside the mast, and no funnel is provided.

THE DUMRA HAS PASSENGER ACCOMMODATIONS

The second small motor vessel which has lately been completed is a more interesting type than the *Bintang*. This is the *Dumra* which was constructed for the British India Steam Navigation Company, for their service on the West African coast. The capacity of the hold amounts to just over 2,000 tons, in addition to which first and second class cabins are arranged amidships around the machinery casing for about 40 passengers. The vessel has a length of 280 feet, the beam being 43 feet 6 inches, the draft 17 feet 6 inches and the molded depth 24 feet. The loaded speed is 11 knots and the designed output of the machinery 1,000 shaft horsepower.

The two Diesel engines in this vessel are of a new type built by the North British Diesel Engine Works of Glasgow, the manufacturers who have recently devoted their attention to a double acting two-cycle Diesel engine of large power, which they are now building at their works. The small motors of the *Dumra,* however, are of the normal single acting four cycle construction, with six cylinders 15 inches diameter and 30 inches stroke, developing their power of about 700 indicated horsepower at 165 revolutions per minute with a fuel consumption of approximately 0.45 pound per brake horsepower hour.

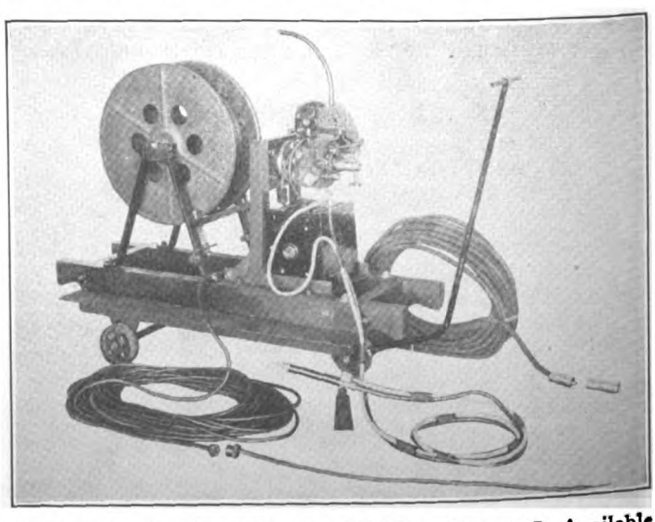
Although these engines are new in design there is little that is novel in their construction. The cylinders are carried on a heavy crank case supported on the bedplate, the cylinder covers and liners being separately cast. The usual four valves in the cylinder head are operated by cams on a camshaft, which is moved in the longitudinal direction when it is desired to go astern, thus bringing the astern cams below the valve operating levers. This movement for reversing is effected in the ordinary manner, through the agency of a compressed air servo motor controlled from the starting platform. There are two starting levers, one for the admission of compressed air, or fuel, to each set of three cylinders, this being a fairly common arrangement. The pistons are cooled with lubricating oil which is somewhat unusual but sea water is used for the cylinder jackets.

Except for the air compressors which are coupled direct to each propelling engine, most of the auxiliary plant is independently driven by electric motors, this including the circulating water and the lubricating oil pumps, etc. Two two-cylinder Diesel engines are installed in the engine room driving 50 kilowatt dynamos for the supply of the necessary power. These are in addition to the large vertical boiler providing steam for the operation of the steam winches.

Portable Semi-Automatic Arc Welding Set

IN order to increase the applicability of its semi-automatic arc welding apparatus, and adapt it for use in any place where current for welding is available, the General Electric Company is now building a portable set. This comprises a complete semi-automatic equipment, with support for a wire reel, mounted on a small truck that can be pulled over the shop floor by hand, or lifted by a crane. The complete outfit weighs about 400 pounds.

The welding equipment consists of a semi-automatic lead, an automatic welding head, with control, and a standard for



The Set Can Be Used Wherever Welding Current Is Available

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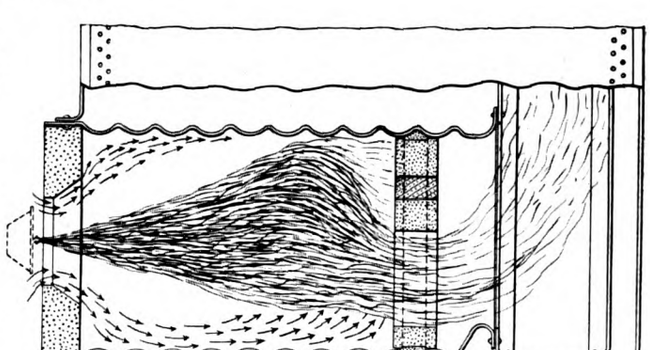
holding a reel of electrode wire. Power is supplied to the arc through a flexible cable with a plug for attaching it to the nearest welding circuit. The reel carrier is equipped with a brake and designed to take any size reel up to 2½ feet in diameter.

The portable outfit should be valuable in repairing parts of machines in place when these parts are too bulky, inconvenient, or otherwise impractical to move, and for doing routine welding of all sorts, such as filling holes in castings, welding seams in pipes or tanks, or other work of a similar nature. Besides the saving in time and trouble due to the portability of the outfit, its use will save both time and material in welding.

The electrode is fed continuously, the number of interruptions are reduced and less skill is required by the operator to make a good weld than is the case with ordinary hand welding. Material is saved by eliminating the waste ends which usually amount to at least ten percent of the total amount of electrode wire used.

Front Arches and Retarders Aid Combustion in Oil Burning Furnaces

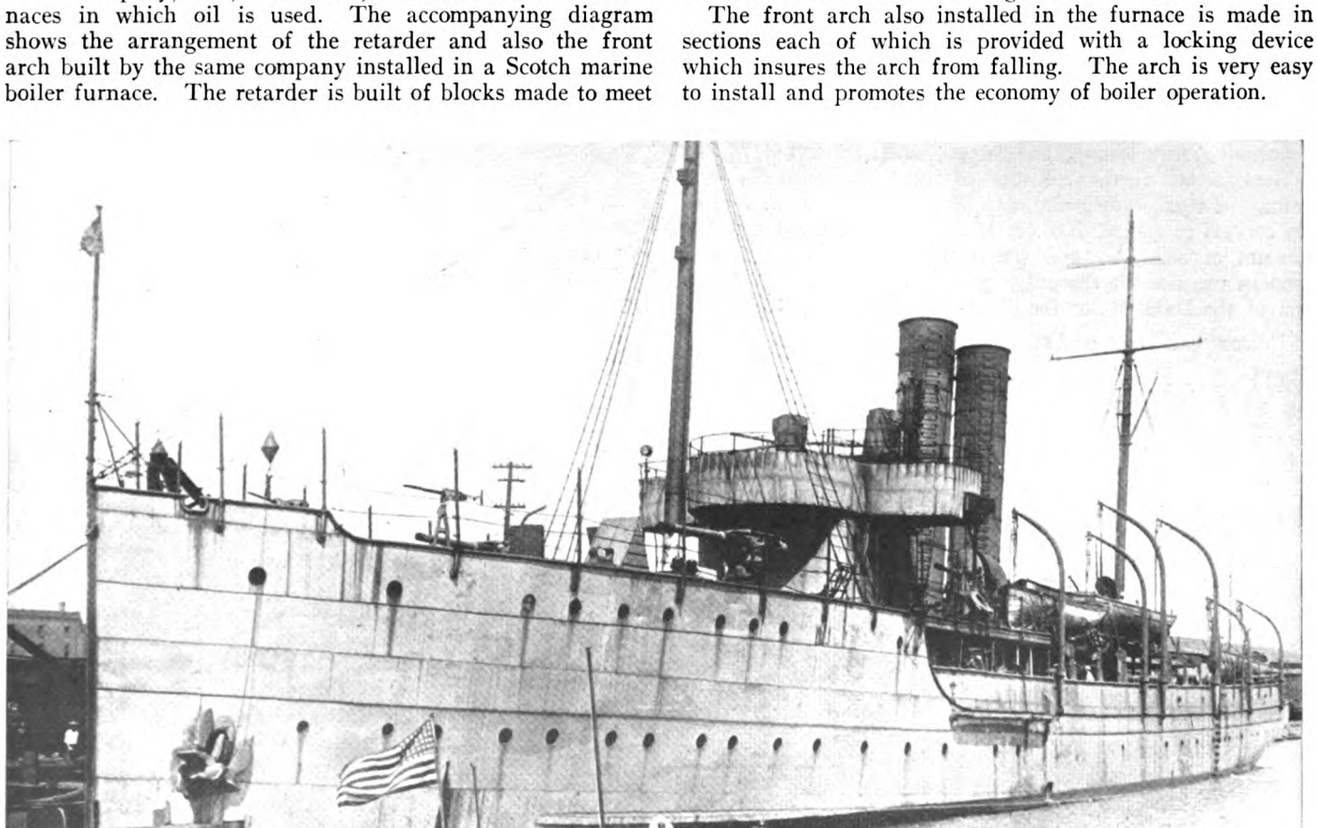
RETARDERS made of refractory brick have been developed by the T. G. Egan Refractory Engineering Company, Inc., New York, to aid combustion in furnaces in which oil is used. The accompanying diagram shows the arrangement of the retarder and also the front arch built by the same company installed in a Scotch marine boiler furnace. The retarder is built of blocks made to meet the actual furnace dimensions, tongued and grooved so that when placed in position they are firmly locked, making falling or warping impossible.



Front Arch and Retarder Installed in Furnace of Scotch Boiler

The retarder acts in a manner to retain the gases in the furnace and, because under the action of the flames it becomes incandescent, the gases are ignited causing complete combustion, increasing the carbon dioxide and greatly decreasing preventable fuel losses. It is stated by the company that savings of more than five tons of fuel per day have resulted from the use of the Egan retarder.

The front arch also installed in the furnace is made in sections each of which is provided with a locking device which insures the arch from falling. The arch is very easy to install and promotes the economy of boiler operation.



(Photograph from Keystone View Company, Inc., N. Y.)

Fitting Out Uncle Sam's Great Lakes Navy for Practice Cruises

On the Great Lakes the United States has only one war vessel, the U. S. S. Wilmette, the hull of which is that of the ill-fated Eastland, which capsized in the Chicago River on July 24, 1915. The photograph shows the Wilmette at the foot of Randolph street, Chicago, being fitted out for a series of two-week cruises on the Lakes, manned by naval militiamen and citizens who desire to make the voyages.

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Marine Boiler Water Treatment

How to Prevent Scale and Corrosion — Water Testing Apparatus—Chemical Changes in a Boiler

By Commander J. B. Patton, U. S. N. (Retired)

SEA water and air are the enemies of the marine boiler. Corrosion and scale are the damages caused by these enemies. Sea water, alone will cause scale but it will not cause serious corrosion unless air is present. By "corrosion" is meant local pitting, which quickly destroys tubes and plates, and not common rust, which is of little importance. The latter is found in tanks and bilges, sometimes ½ inch thick and formed by a thin film of iron. The rust is light in density, and contains only a percentage of iron.

But as all water has some air in it, we cannot keep air entirely out of the boiler. The Weir feed water heater extracts most of the air, and ships with this heater have very little boiler corrosion, even when using salt water in the boilers. Experience proves that a small amount of sea water always gets into the boilers so we cannot expect to keep sea water and air entirely out of boilers. But we can win the battle, if we keep the salt down to a low quantity (say ⅛ by salinometer, or 150 grains of chlorine in a watertube boiler, and double that amount in a Scotch boiler), because a small amount of soda ash will neutralize that amount of salt water and prevent both corrosion and scale.

If the density gets higher, considerably more soda will be required and it should be put in, unless priming of the boilers forbids further addition of soda. If sufficient soda cannot be used, some scale may be formed but there will be no serious corrosion, if there is no air in the water. The amount of soda required was formerly guessed at but in modern practice the amount required is indicated by a daily test of the boiler water for alkalinity, as explained later.

Condensed Rules (Approved by Good Authorities)

(1) Buy a practical instrument for testing boiler water for alkali and chlorine (salt).

(2) Try to keep salt water out of the boilers. If the condenser leaks, stop and repair it, if possible.

(3) Try to keep air out of the boiler water.

(4) Test the water in the filter tank each watch for chlorine. If it contains under 40 grains, you can not taste the salt.

(5) Test the water in the boilers daily for alkali and chlorine, and maintain *an alkalinity of* 10 *to* 20 *grains per gallon* by putting daily additions of soda ash in the filter tank. As a starter, when filling a single-ended Scotch boiler of about 26 tons' capacity, put in 20 pounds of soda ash (other size boilers in proportion). This will start you off with an alkalinity of 20 grains to the gallon. Then a daily addition of one pound of soda ash to the filter tank for each boiler in use will be about right, unless the condenser leaks considerably (admitting salt water and neutralizing the soda). In this case, considerably more soda will be required to keep up the alkalinity. The alkali test will indicate whether the daily addition of soda ash is to be increased or diminished. There is an advantage in having the soda in the boiler before the salt gets in.

(6) It is best to have a ten-gallon water tank over the filter tank and to put the daily allowance of soda ash in it. A pipe and valve should be arranged so the mixture will drip into the filter tank all day long. This keeps the water alkaline and prevents corrosion around the discharge end of the internal feed pipe. But if you are unwilling to take this trouble, put it in once a day.

The Navy plan of removing air from feed water appears to be a good one; it is an adaptation of the Weir system to a high pressure heater. A quarter-inch pipe is run from the top of the feed heater or feed line and led back to the filter tank, with a valve kept slightly open. The air and also any oil present come back to the filter tank. The small amount of water coming back is not important. The high pressure tends to keep the air in solution but the high temperature tends to release it.

The internal feed pipe arrangement of the Babcock and Wilcox boiler is a good plan and might well be adapted to the Scotch boiler. This pipe discharges over the downcomer headers, but just under the water level, so that the air escapes to the steam space and does not follow the water to the bottom of the boiler.

Zincs

There is good reason to think that zincs are not needed when the water is kept alkaline. But the water is not always kept alkaline, and when the density is high, it may not be possible to keep it alkaline. For this reason, the zincs should be retained.

Action in the Boiler

In order to visualize what takes place in a boiler when salt water and soda ash are present, the following example is given:

Consider a single ended Scotch boiler, capacity 7,000 gallons or 26 tons, a very common size. As there are 7,000 grains in a pound, it happens that "pounds per boiler" and "grains per gallon" are the same thing for this size boiler. Suppose the boiler filled with fresh water, and 20 pounds of soda ash added. An alkali test should then show 20 grains per gallon. If one pound of soda be added daily, then after 30 days' steaming the boiler will have a total of 50 pounds of soda ash, or 50 grains per gallon. If the density has gone up to 120 grains of chlorine, or 1/10 by salinometer, then 40 pounds of the soda will have neutralized all the acid forming and scale forming elements in the boiler, and there will be 10 pounds of free soda left, or 10 *grains per gallon* of alkalinity by test.

As a matter of fact, the alkali test will probably show around 15 *grains per gallon*, on account of a very *important fact*. When an alkali test is made, the first ten grains may be a false alkalinity due to carbonates present, which does not mean the presence of free alkali. An actual test of water from the S. S. *Castletown* showed water of 3 grains alkalinity, and also containing 107 grains of magnesium chloride, showing the water to be highly corrosive and *potentially* acid. Since the days we stopped using animal or vegetable oils for internal lubrication, there is no such thing as boiler water giving an acid test or reaction. Boiler water containing a little salt may be *potentially* acid or corrosive, if it shows an alkali test of less than 5 or 10 grains. It may not be even "neutral" unless it shows this alkalinity. These facts are supported by good authorities in this country and in England and will be referred to later.

Condenser Leaks

If the condenser leaks sufficiently to supply the "make up" or "extra feed," the density in the Scotch boiler will go

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up to 1/8 that of sea water, or 150 grains, in a day; in a watertube boiler, 6 to 8 hours. The filter tank water will have a density of about 40 grains per gallon, which cannot be detected by taste. This shows the importance of making frequent tests of filter tank water for chlorine.

ALKALI

The standard alkali is soda ash (powder), or carbonate of soda. Sal soda (crystal) is the same thing, but only about half as strong, as it contains 60 percent water of crystallization. Some prefer it because it is easily handled. In a hot place it will melt in its own water.

Caustic soda, while chemically different, may be said to be, very roughly, about 1½ times as strong as soda ash. This is referred to later. Its use is recommended by some good authorities.

Lime will prevent corrosion and is about 1½ times as strong as soda ash but it is hard to dissolve and does not prevent scale but rather increases it, so its use is not recommended.

Boiler compounds of unknown formulæ are to be avoided. The Navy boiler compound is probably better than pure soda ash. Its formula is said to be as follows:

95 percent soda ash;
4 percent di-sodium phosphate (which is said to prevent priming);
1 percent organic matter (which is said to keep scale from settling on the heating surface. This is in line with the old idea of putting molasses, potatoes or sawdust in a boiler).

SHORE WATER

Shore water should be tested for chlorine (salt). Many shore waters contain considerable limestone and calcium sulphate, which are scale forming and are not indicated by the chlorine test. But if soda ash be used, they will be made harmless.

BLOWING

Every pound of sea water that goes into a boiler (unless neutralized with soda) produces some hard scale. You blow out the salt but not the hard scale. Unless the feed water is fresh, it is best not to blow.

If the condenser leaks, it is best to stop and repair it. If this cannot be done, it is best not to blow unless the boilers prime, or the density gets up to 2/32, when salt is said to begin to deposit in a high pressure boiler. In any case, it is useless to blow unless the feed water is a great deal fresher than the water in the boiler.

APPROXIMATE CONDITIONS IN A BOILER CONTAINING SOME SEA WATER. QUANTITIES SHOWN ARE GRAINS PER GALLON, OR POUNDS PER BOILER IN A 26-TON BOILER

1	2	3	4	5	6	7	8
Ounces	Density by Salinometer	Chlorine	Total solids	Salt	Hard scale	Corrosive matter	Total soda ash required to neutralize 6 and 7
5	1/32	1200	2100	1700	100	300	400
2½	½ of 1/32	600	1050	850	50	150	200
1¼	¼ of 1/32	300	525	425	25	75	100
⅝	⅛ of 1/32	150	262	212	12	37	50

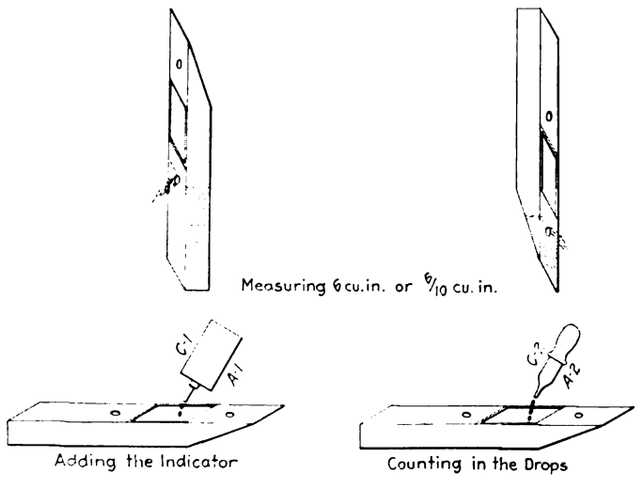
WATER TESTING APPARATUS

There are several types of chemical outfits which may be purchased. All of them use the titration method. The alkali is neutralized by a measured quantity of acid. The chlorine is precipitated by a measured quantity of silver nitrate. Some of these outfits measure alkali only; some measure both alkali and chlorine. All of them are made of glassware, which is liable to be broken on board ship.

The Boiler Water Testtool (Invented by the writer).—This is a new instrument for testing water for both alkali and chlorine. It is sold by The Marine Works, Inc., 31 Coenties Slip, New York City. In this set, glassware has been practically eliminated. There are only five movable articles and these are made of metal or rubber. The measuring is automatic and there is no necessity for peering at faintly graduated glass tubes.

There is a white enameled ironware measuring and mixing tray in which the water sample is measured and tested, as explained below. The two indicators are in metal cans with nozzles. The acid and silver solution are measured by standardized hard rubber droppers, giving a drop of constant size.

To measure a sample of 6 cubic inches of water, the Testtool is dipped full of water and then held vertically, big end down, and the excess overflows and the water level falls even with a hole in the tray, thus retaining 6 cubic inches. The Testtool is then held horizontally, ready for the test.



Sketch Showing Operation of Testtool

This size sample is used for alkali test, or for testing fresh water for chlorine.

If held with the small end down, a sample of 6/10 cubic inch is measured. This size sample is for making chlorine test of salty water.

For the alkali test there is a can *A-1* (oil can type) containing Phenolphthalein indicator of which *several* drops are added to the water sample and which should turn red. Bottle *A-2* contains a standard acid and has a *standardized dropper*. The acid drops are counted into the tray, until the red color disappears; the number of drops used indicates the grains per gallon of soda ash.

For the chlorine test there are: Can *C-1*, containing potassium chromate indicator, and bottle *C-2* (with dropper), containing nitrate of silver solution. When testing *fresh* water, 6 cubic inches are used and *several* drops from *C-1* are added. Then sufficient drops from *C-2* are counted in till the water turns *red*. Each drop of nitrate of silver indicates one grain of chlorine. When testing *salty* water, 6/10 cubic inch of water is used and each drop of *C-2* indicates 10 grains of chlorine.

During this test there is nothing to break or even fall off the desk, for the Testtool is held in the left hand and the dropper in the right hand. The above has been found to give very accurate results.

CHEMICAL CHANGES IN A BOILER

The following is a brief statement of the changes which are said to take place in a high pressure boiler containing some sea water and soda ash:

Composition of sea water	Grains per gallon
Calcium carbonate	9
Calcium sulphate	114
Magnesium sulphate	134
Magnesium chloride	244
Sodium chloride	1706
	2207

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1. The sodium chloride remains in solution, but may begin to deposit, if the density reaches two or three thirty-seconds.
2. The calcium sulphate forms hard scale but, if soda ash is present, calcium carbonate goes to the bottom as sludge and sodium sulphate remains in solution.
3. The magnesium sulphate is corrosive and may form scale, but the soda neutralizes it, precipitating the magnesium as sludge, sodium sulphate remaining in solution.
4. The magnesium chloride is corrosive but the soda neutralizes it, precipitating the magnesium as sludge, sodium chloride remaining in solution.

AIR IN WATER

When corrosive salts are present, air and carbon dioxide are stimulating factors and increase corrosion immensely. There is reason to believe that air in fresh water is harmless. There are reports of corrosion of feed heaters at stationary plants by air in the water but probably some corrosive salts are present.

At the Naval Proving Ground, Indian Head, Maryland, there are watertube boilers with non-condensing engines, that have been in use many years without corrosion. The feed water comes from an artesian well by air lift pumps, and is strongly charged with air. It is pumped into the boiler cold. This water is practically pure having only a trace of silicon.

The power plant boilers at the Norfolk Navy Yard used 100 percent "make up" feed water and the water was well aerated, coming from a lake. There was no corrosion after years of service.

The tugboat *Leader* in New York harbor has a boiler forty-four years old, with the original tubes. The engine is non-condensing, and the feed water is New York city water, which contains air, of course, but no corrosive salts. The air did no harm here.

ALKALI

Some years ago, the Scotch boilers of a new naval ship had to be retubed after two years' service. After a short time the new tubes began to pit. Within a year the tubes were giving out at the rate of one a week. No alkali had ever been used in the feed water. At this time the *storekeeper* was told to put two pounds of soda in the feed tank daily. That is absolutely all that was done; the result was that not another tube was lost and the ship ran many years with the boilers tight and sound.

S. S. Castletown.—A test of the boiler water on this ship showed 800 grains of chlorine, 107 grains of magnesium chloride and 3 grains of alkalinity. About 40 grains of soda per gallon had been used but it was not sufficient and the water was potentially acid although it gave an alkali test of three grains. In order to get this alkalinity up to ten grains, indicating an excess of free soda, it would be necessary to add sufficient soda to first neutralize all the corrosive salts present, or over 100 grains of soda ash per gallon.

The names can be given of many ships with good boiler tubes and furnaces thirty years old. On the other hand, many boilers are worn out in ten years or less. The writer was told recently, by a former superintendent of coastwise vessels, that he found the life of Scotch boilers to be about ten years.

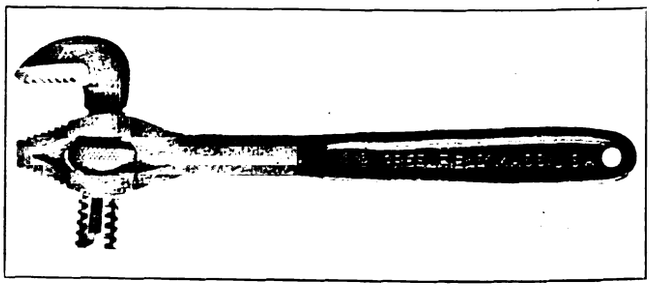
There must be a reason for this difference in durability, and there is no doubt that in most cases boiler corrosion and scale troubles are due to neglect of the simple and well-known rules referred to in this paper.

RECIPROCAL INSPECTION OF BELGIAN STEAM VESSELS AUTHORIZED.—Under the provisions of an act of Congress approved March 17, 1906, the Secretary of Commerce, in Department Circular No. 289, dated July 15, 1922, authorized the reciprocal inspection of Belgian merchant passenger steam vessels, so that thereafter the merchant passenger steam vessels of Belgium sailing from ports in the United States and holding unexpired certificates of inspection issued by the duly constituted officers of Belgium shall be subject to no other inspection than such as necessary to satisfy the local inspectors that the condition of the vessel, her boilers, and life-saving equipments are as stated in the said current certificate of inspection. Copies of Circular No. 289 can be obtained on application to the Steamboat Inspection Service, Department of Commerce, Washington, D. C.

Pipe Wrench Designed for Difficult Corners

THE Little Giant pipe wrench, embodying several interesting new features, has just been put on the market by the Greenfield Tap & Die Corporation, Greenfield, Mass. This wrench has the "end opening" feature which is familiar to users of machinists' wrenches. Its application to pipe turning can readily be seen by a glance at the illustration.

One important advantage of the Little Giant wrench is the ease with which it can handle pipes in corners, close to walls, and similar confined places. The person using it can set it straight on the pipe as he would a pair of pliers, instead of having to fit the jaws on from the side. There are only three parts, a handle and jaw in one piece, which is drop forged and heat treated; a movable jaw, likewise drop



Little Giant Pipe Wrench Embodying New Principle of Design

forged and heat treated; and a hardened steel nut. In spite of the absence of springs the wrench is said to take hold and release instantly at the option of the user.

The new wrench has been designed for maximum strength, the 14 inch size having successfully withstood stresses in excess of 4,700 inch pounds without slipping or bending. Yet owing to the elimination of extra parts the wrench is relatively light in weight.

Another feature is the double set of teeth on the main jaw. The movable jaw can be engaged at the option of the operator with either of these sets of teeth with consequently lengthened life. On the large sizes, 14 inches and greater, two additional sets of teeth are provided, making four in all, and the movable jaw can be reversed to engage these additional sets of teeth, which are below the adjusting nut. This is very useful in connection with certain classes of work, besides tending to quadruple the life of the tool.

The Little Giant wrench is being manufactured in 8-, 10-, 14-, 18- and 24-inch sizes, of which the three smaller sizes are already on the market.

NAVY LEAGUE DESIGNATES OCTOBER 27 AS NAVY DAY.—At the suggestion of the Navy League of the United States, approved by the Navy Department, Friday, October 27, has been set apart as Navy Day on which an opportunity will be given for all the citizens of the country to honor this branch of the service which safeguards our peace and prosperity.

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Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Valve Setting Problem

Q. (1167).—I have a twin screw reciprocating installation, link motion, cylinders 15½ by 26 by 44 inches; stroke, 26 inches; piston valves for high pressure and intermediate pressure inside admission and piston valve outside admission for low pressure cylinder. This particular design gives crossed rods and the approximate leads at full stroke are: High pressure, ¼ inch bottom, ⅜ inch top; intermediate pressure and low pressure, 9/16 inch bottom and 7/16 inch top. High pressure valve is a plug valve and the other two stages are ring valves. The steam pressure at engine is 225 pounds.

I desire your advice in regard to the most suitable setting for these valves in order to bring about an economical distribution and consumption of steam and turn up 125 to 128 revolutions per minute at maximum cut-off, so as to be able to get approximately 135 to 140 turns at or about full stroke, as these engines are used in towboat service in the Federal Barge Line and it is often necessary to run out the expansion blocks and get all she has going through swift places.

Would a link motion having open rods be more suitable in your estimation than the present one with the cross rods? These engines were originally built to turn outboard as is the general practice with twin screw installation ships but when placed in this service were required to turn inboard when in ahead motion. To bring this about the crank shafts were merely transposed and to the best of my knowledge no other particular changes were made.

A. (1167).—Your question relative to the resetting of the valves for improved steam distribution is one which for its solution requires more of an investigation than is practicable for the editors of this department to undertake. At best the results which might be reached would be theoretical only and in all probability no better than the present valve setting. Inspection and comparison of your leads with engines of similar proportions and size would indicate the setting to be about the usual practice.

The most reliable and satisfactory results would be obtained by taking top and bottom indicator cards and computing the developed power from each cylinder under various conditions of cut-off, a cut and try process, until the cards show an approximately even distribution of power between the cylinders.

In an engine running in full gear the valve events are the same regardless as to whether the rods be open or crossed but when linked up the events are greatly changed. Lead increases when linking up with open rods but decreases to the point of negative lead with crossed rods.

Steam and exhaust openings decrease with crossed rods linked up, therefore the effect of the advantage of steam expansion is greatly decreased. The above would indicate that far better results would obtain from the use of open rods.

Relative Resistances of Models and Full Size Ships

Q. (1168).—Can you favor me with the facts which govern in the acknowledged standards by which the relative values of efficiency in testing model ships compare with the full size ship? For instance, a model shows 10 percent better results than the others, what will that represent in a full size ship?

A. (1168).—In deriving the resistance of the full size ship from that of the model as obtained from tests, Froude's law of comparison is assumed to apply in so far as resistances other than frictional are involved. This law is briefly as follows: If the linear dimensions of a ship are p times those of its model and the resistances of the latter at speeds V_1, V_2, etc., are R_1, R_2, etc., then at the corresponding speeds of the ship, $V_1\sqrt{p}$, $V_2\sqrt{p}$, etc., the resistances of the ship will be R_1p^3, R_2p^3, etc.

The total resistance, either ship or model, is made up of the frictional, the wave making, the eddy making, etc. The frictional resistance, as above noted, does not follow the law of comparison. It varies with (speed)$^{1.825}$ and the frictional coefficient is different for long and short surfaces. The frictional resistance is generally estimated from a formula of the form $R_f = f\,S\,V^{1.825}$ in which S is the area of wetted surface in square feet, V is the speed in knots, and f is the coefficient experimentally determined for different lengths of wetted surface. This formula applies both to ship and model.

The total resistance of the model being known at a given model speed, the frictional resistance of the model is computed by the formula referred to above and deducted from the total model resistance. The remaining model resistance is expanded by Froude's law to obtain the residuary resistance of the ship at the corresponding ship speed. The frictional resistance of the ship is then computed similarly to that of the model. The total ship resistance is the sum of the residuary and the frictional ship resistances as just found.

A 10 percent difference in the resistances of two models may indicate a 10 percent difference in the resistances of the two ships represented but this does not necessarily follow. The relative values of the residuary and frictional model resistances for the same model as well as the differences in these resistances as between model and model affect the relationship between the ship resistances. It is a matter of calculation for the individual case.

Wood vs. Steel for Houseboat Construction

Q. (1169).—I am considering building a shallow draft houseboat and have already prepared plans which contemplate a hull 60 feet in length, 20 feet in breadth with a draft of 18 inches. I had originally intended to build the hull of wood but have thought that steel might be preferable because of its non-inflammable nature. Please discuss the relative values of wood and steel for boats of this type.

A. (1169).—Wood is almost always used in the construction of hulls whose lengths are less than 100 feet. This is perhaps due principally to the fact that there are many small boat building concerns scattered throughout the country which, while they are capable of building excellent wooden hulls, have neither the plant nor the personnel necessary to work steel. Therefore, one may build in wood and avoid meeting the heavy charges for overhead which the equipment necessary to work in steel involves. A steel hull may cost roughly from 30 to 40 percent more than a wood hull of the same dimensions.

It is generally possible to build a small boat of wood on a smaller hull weight than that of a similar steel hull of the same dimensions. This is because the members of the structure which are required to resist the bending and racking strains on the wooden boat as a whole are of ample size to withstand the local forces met in service while their

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weight is less than that of the steel members designed for equivalent service in a steel hull.

In boats of small displacement it is necessary to use very thin plates and very light shapes in order to build a steel hull on the same weight as a wooden one. It results that the wooden hull is stronger locally than the steel hull. Because of this, the steel hull may, after a comparatively short period of service, show so many dents or dishes in the plating as to give it a very unsightly appearance even though entirely seaworthy.

Further, the insulating of a steel hull against heat and cold and the elimination of sweating present a somewhat more difficult problem than the ceiling of a wood hull.

In spite of the foregoing there are strong arguments in favor of the steel hull once one accepts its increased cost.

A properly designed steel hull is stronger against bending and racking forces than a wood hull. It is also stronger against longitudinal shearing forces.

It is tighter and freer from vermin than a wood hull.

It is not subject to water logging or soakage, with the increase in draft incidental thereto, and is, as you suggest, safer from damage by fire.

When the hull length approaches or exceeds 100 feet, the scantlings necessary in a steel boat to satisfactorily meet the bending and racking forces become sufficient so that minor bumps are easily withstood without local damage. Also at about this length the steel hull begins to have a real advantage over a wood hull from the weight standpoint.

International Shipping Conference Committee Reports

(*Continued from page* 648)

been slightly adjusted to give factors of subdivision which vary inversely as the length of the vessel when the origin of the curve is fixed at a length of 260 feet with unity factor.

(2) Whether the general form and position of the curve B_1, as suggested in the Report, is generally acceptable, observing that it is now admitted curve B of the Convention, which is supposed to apply to a mixed type of vessel, is too stringent for vessels carrying mainly cargo and few passengers.

As regards the curve representing the lower standard of subdivision on the diagram, it should be remembered that whatever the number of passengers carried on a vessel, the appropriate factor of subdivision will always be decided by the Criterion of Service value obtained for that vessel.

(3) Whether the form of Criterion of Service suggested in the Report (11A) and the subsequently explanatory letter of December 14, 1921, is generally acceptable or whether, having regard to the subsequent note, a modification of this form of criterion is desirable.

(4) To discuss the limitations within which the curves B_1 and C_1 shall be applicable, having regard to the fact that below a certain length of vessel it is not economically possible to provide a one-compartment standard throughout the length, and that at and above certain higher limits of length all safety requirements seem to be reasonably met when any two adjacent compartments throughout the length can be flooded.

With regard to the Criterion of Service, it may be desirable to offer some further remarks.

It is extremely necessary that the Criterion of Service should be determinable in the early stages of the design. It can only, therefore, take account of the main factors involved.

It is suggested that the factors which may be expected to be known at this stage are: Length, breadth, depth to bulkhead deck, draft, displacement volume, speed, horsepower, permanent passenger accommodtion below the bulkhead deck and number of passengers.

These factors should be combined in such a way that the numerical result obtained will closely approximate to the numerical values obtained from the actual ship when completed. They must also be combined in such a way that they will fairly differentiate between ship and ship in relation to the passenger-carrying function. It is to be observed that the passenger-carrying function must reflect the ratio which the space given to passengers bears to the total space available in the ship, subject to a correcting factor which shall to some extent take account of machinery space or horsepower or speed.

Express Liner Construction May Follow Passage of Shipping Bill

BELOW is published an extract from a letter of Chairman Lasker of the Shipping Board to Senator King of Utah which was written in refutation of remarks made by the senator following a printed resolution which he introduced in the Senate mentioning the financing by the Shipping Board of private ship construction in the event the shipping bill passed. Chairman Lasker said in part:

"Let me say that I never made any statement that the Shipping Board intended to advance private parties $25,000,000 for the construction of a ship, nor did I ever make any statement that anyone could, in good faith, construe to mean any such thing.

"In reply to inquiries from newspaper men as to whether the Shipping Board had any requests for loans for construction purposes, I stated that we had no formal requests but that in an informal way a new company that was being projected on paper (but for whose ultimate formation I could in no wise stand guarantor) had asked whether they could borrow as much as $25,000,000 providing they put $45,000,000 of their own money into building new ships, of which two would be 70,000-ton ships; in other words if, out of the Construction Loan Fund which the Shipping Board is authorized by law to create, the Shipping Board was prepared to lend $25,000,000 for which we would get as security $70,000,000 worth of ships.

"Of course, I could make no reply to the tentative question I explained to the persons making the informal inquiry that they would have to formally organize their company, pay in their money, submit the definite plans of the ships, and at such time the matter be taken up with the entire Shipping Board for consideration.

"I am happy to state to you, though, that I was much impressed by the stability of the people who made the tentative inquiry, and feel that they are serious in their desires to build ships that will be crown jewels in our merchant marine. Whether or not they will proceed as they stated, will depend on the fate of the pending bill to aid merchant shipping, but in the interim they are having plans drawn for their ships.

"The most encouraging moment in the history of America's merchant marine will be that moment when private parties actually subscribe $45,000,000 of their own money to put into $70,000,000 worth of ships and the government will receive full security for its advance."

NEW BOOKS

HOW TO START MARINE ENGINES IN A COLD SHIP. By W. J. Woodcock. Size, 7¼ by 4¼ inches. Pages, 153. Diagrams, 13. New York, 1922; Spon and Chamberlain.

This is a valuable reference book, prepared by a sea-going engineer who holds licenses for operating ocean steamers and motor vessels of unlimited tonnage, giving full instructions for setting all the valves and operating single and cross-compound turbines, triple expansion engines, semi-Diesel engines and a full Diesel electric drive on ships. It is a thoroughly practical book and is written so that men in the engine and boiler rooms of modern sea-going vessels may become familiar with the equipment and with a systematic manner in which to handle it so that they can safely start a marine engine under any condition, or in a cold ship, without unnecessary loss of time and without any feeling of uncertainty as to the proper and safe procedure. Simplified diagrams show the location of all valves and piping in each case and the instructions for operating the machinery from the time the ship is cold until it has completed its voyage are as clear and concise as if given by the engineer on watch.

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NEW BOOKS

Diesel Operators' Guide

Reviewed by A. B. Raymond*

THE 20TH CENTURY GUIDE FOR DIESEL OPERATORS. By Julius Rosbloom and Orville R. Sawley. Size, 6¼ by 8⅞ inches. Pages, 637. Profusely illustrated. Seattle, Wash., 1922: Western Technical Book Company, Inc.

Those interested in the development of the marine Diesel engine have been looking for the publication of a book covering this subject in a comprehensive way. Messrs. Rosbloom and Sawley have undertaken to fill this gap and have compiled a mass of information and collected a large number of illustrations which make their book a very interesting and handy reference hand book.

The first three chapters cover such subjects as: Technical Terms, Theory and Miscellaneous Formulæ. Chapters 4, 5 and 6 cover the Principles of Diesel Operation, Liquid Substances and Questions and Answers on Diesel Operation. Chapters 7, 8 and 9 deal with Fuel Feed and Ignition, Principles of Construction, Auxiliary Machinery and Accessories.

Chapters 10, 11 and 12 treat of Detailed Description of Diesel Engines, Diesel Electric Propulsion and Low-Compression Oil Engines. Chapters 13, 14 and 15 cover Compressors, Pumps and Batteries.

The last chapter gives the United States Rules for Licensing of Engineers on Motorships, Lloyd's Rules and Extracts from Rules of American Bureau of Shipping.

Both the illustrations and text are well indexed.

Information in varying amounts is given regarding the following Diesel engines: Allis-Chalmers, Atlas-Imperial, Busch-Sulzer, Burmeister & Wain, Dow, Fulton, Junkers, Lombard, McIntosh & Seymour, Nelesco, Nobel, Nordberg, North British, Sperry, Still, Standard, Washington-Estep, Western, Werkspoor, Winton and Worthington.

The semi-Diesel and oil engines referred to are the Baltimore, Bolinder, Cummins, De La Vergne, Fairbanks-Morse, Gulowsen-Grei, Ingersoll-Rand, Kahlenberg, Mietz and Weiss, Petter, Prim, Steinbecker, Vickers and Wygodsky.

The authors have accomplished so much it may seem an imposition to suggest that no mention has been made of many makes which are on the market either here or abroad at the present time, such as: Ansaldo, Armstrong-Sulzer, Beardmore-Tosi, Camellaird-Fullagar, Doxford, Enterprise, Götaverken, Hawthorne-Werkspoor, Johnson, Kincaid, Krupp, Neptune, North Eastern, Pacific, Polar, Schneider, Stephen-Sulzer and Wallsend-Sulzer. Many of the above are built under license from well-known makes but the individual development is often of great interest.

The Diesel engineer also has many problems in connection with the auxiliaries and with the actual installations, such as taking care of the exhaust, foundations, critical speeds and vibration and added information upon these subjects will surely be welcomed.

Some of the formulæ given need a careful checking, as well as the index, and the English might be improved.

OBITUARY

FRANK M. HAWKINS who has been connected with the Crouse-Hinds Company, 30 Church Street, New York, for a period of twenty-five years, died recently. Mr. Hawkins had been actively engaged in the upbuilding of the business of this company and his loss will be keenly felt by all those associated with him.

GEORGE R. EDGCUMBE, purchasing agent for the Clyde and Mallory Steamship Lines, New York, died recently at his home in Jersey City, N. J. He had served in various capacities with the Mallory Line for a period of forty-seven years, beginning his career with the company as a clerk in 1875. In his years of steamship service, Mr. Edgcumbe has won the greatest respect from friends and business associates alike.

PERSONAL MENTION

P. J. FARRINGTON has resigned from the staff of the United States Navigation Company.

ELMER E. FROEWISS, formerly with the Oriental Navigation Company, is now associated with the Kerr Steamship Company.

CHARLES BACKMAN has organized the Backman Towing and Transportation Company, Inc., with offices at 15 Whitehall Street, New York.

D. V. STRATTON has joined the organization of the Morse Dry Dock & Repair Company and is in charge of the New York office in the Whitehall Building.

CAPTAIN JAMES ABERNATHY, formerly in command of the steamship *M. S. Dollar*, has been appointed port captain of the Robert Dollar Company at New York.

P. R. CROCKER has resigned as traffic assistant at the New York office of the United States Shipping Board and on his return from a two months' trip in Europe will enter private business.

HAROLD DOLLAR, son of Robert Dollar, has left San Francisco for Shanghai to become Oriental manager of the Robert Dollar Company. He has recently been elected president of the American Chamber of Commerce at Shanghai.

CAPTAIN FRANCIS H. ROBINSON, who has been connected with the Pacific Mail Steamship Company at San Francisco and the California Atlantic Steamship Company for many years, has joined the staff of the Munson Steamship Lines.

NORMAN B. BEECHER, one of the admiralty counsels of the United States Shipping Board, will represent the Board at the meeting of the Comite Maritime at London, October 9-11, to discuss the proposed rules for the carriage of goods by sea.

CHARLES N. CROWELL, naval architect and constructing engineer, has severed his association with William T. Donnelly, consulting engineer, New York, and returned to his home in Cambridge, Maryland, where he has established a temporary office.

G. H. POUDER, of the Export and Import Board of Trade of Baltimore, Md., will give lectures during the second semester of the 1922-1923 sessions, at the University of Maryland, on terminal management and expansion, which will be in conjunction with the university's commercial and economics course.

S. M. PHILLIPS, of the Maintenance and Repair Department of the United States Shipping Board, will conduct the evening classes in naval architecture and marine engineering at the Brooklyn Polytechnic Institute, Brooklyn, N. Y., this year, providing the required number of students register before October 5. Mr. Phillips has conducted this class in past years with success. His experience in the yard, drafting room and naval architect's office give him exceptional qualifications for understanding what the student needs most to prepare him for a good job in the shipyard.

F. W. LEAHY, one of the best known engineers in marine circles, has resigned from the management of the New York office of the Diamond Power Specialty Corporation to es-

* Naval architect, Tams & King, New York.

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tablish his own business, the Leahy Engineering Company, with offices at 709 Second National Bank Building, Cincinnati, Ohio. The new company is specializing in power plant equipment as well as in several marine lines for river boats.

REAR ADMIRAL D. W. TAYLOR, U. S. N. (RETIRED), has been engaged as consulting expert in matters of ship design, construction and operating economy with the American Ship and Commerce Corporation. Admiral Taylor was chief constructor of the United States Navy and chief of the Bureau of Construction and Repair until July 1, 1922, at which time he retired. Since then he has been engaged in claims board work which will be completed in time to take up his duties with the American Ship and Commerce Corporation, October 1. His headquarters for the time being will be in Washington. Rear Admiral Taylor is the author of a number of books on naval subjects and is recognized as the highest international authority on steam power and ship propulsion. He is the first American ever honored by the award of the gold medal of the British Institution of Naval Architects for the best original paper on ship-shaped stream forms. He was retained by the British Government as an expert in the famous case growing out of the collision of the *Olympic* and the *Hawke* in 1911.

Rear Admiral D. W. Taylor, U. S. N. (Retired)

A. P. ALLEN, manager of sales and repairs of the Federal Shipbuilding Company, with sales offices at 26 Beaver street, New York, has resigned from the Federal organization and will enter a manufacturing and sales business of his own, the nature of which has not as yet been made known. Mr. Allen has been with the Federal Shipbuilding Company, a subsidiary of the United States Steel Corporation, for over two years and has during this time built up an efficient sales organization. Previous to his connection with the Federal shipyard, he was chief engineer of the Pacific coast plants of the Bethlehem Shipbuilding Corporation and during the last part of the war he was stationed in Washington as chief engineer and assistant manager of the Department of Construction and Repair of the United States Shipping Board.

A. P. Allen

ELMER SCHLESINGER has resigned as general counsel of the United States Shipping Board, the resignation taking effect September 1. Mr. Schlesinger joined the Board in June, 1921, with the idea of spending a few months in organizing the legal department of the Shipping Board and the Emergency Fleet Corporation. His services, not only in organizing the law department, but in protecting the interests of the Government, particularly in the matter of the large number of undisposed claims pending against the Shipping Board at the time he commenced his work in the department, have been very valuable. Mr. Schlesinger will return to private practice at once as a member of the firm of Stanchfield and Levy of New York.

SANFORD H. E. FREUND and CHAUNCEY G. PARKER have been appointed as general counsel of the United States Shipping Board and the Emergency Fleet Corporation following the resignation of Elmer Schlesinger. Mr. Freund will have general supervision and control of the Admiralty division, the contract, opinions, recoveries and special assignment division of the Emergency Fleet Corporation and other legal matters of the United States Shipping Board besides claims and litigation. Mr. Freund has been special counsel with the Emergency Fleet Corporation during the past year. He graduated from Harvard University in 1901 and from the Harvard Law School in 1903. His career from that time until 1910 was mainly devoted to lecturing at Boston Univerity Law School, University of Chicago Law School and at the Harvard Law School, at the same time practising law in the city of Boston. From this time until 1918 he was general attorney for various railway companies; from then until 1919 he served as director of the United States Employment Service and also as a member of the facilities division of the war industries Board. In 1919 and 1920 he was assistant general counsel of the United States railway administration in charge of financial affairs. He resigned from this position and practised law in New York until he became special counsel of the Emergency Fleet Corporation.

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S. H. E. Freund

CHAUNCEY G. PARKER, before assuming his duties with Sanford H. E. Freund as general counsel of the United States Shipping Board, was special counsel with the Emergency Fleet Corporation during the past year. He will have control and direction of litigated cases throughout the United States and also supervision of claims presented to the United States Shipping Board. He graduated from Harvard University in 1885 and Columbia University in 1887; from 1888 until 1915 he practiced law in New Jersey, taking a prominent part in several of the leading litigated cases in that state; in 1915 he served as receiver to the International Mercantile Marine Company and the Rock Island Company; in 1918 he was made special legal expert with the War Risk Insurance Bureau, Washington.

Chauncey G. Parker

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Shipbuilding, Reconditioning and Operation

Port Expansion, Passenger and Freight Activities and Other Notes of Interest in All Branches of the Marine Industry

Contract for Constructing Two Steamers to Cost $6,000,000 Awarded to Great Lakes Yard

THE contract for the construction of two passenger steamers to cost a total of approximately $6,000,000 has been awarded to the American Shipbuilding Corporation of Cleveland, O., by the Cleveland and Buffalo Transit Company, according to official announcement today.

The vessels will be of the paddle-wheel type driven by reciprocating engines and are to be 544 feet in length by 58 feet beam, which is a slight modification from the original intention, which is understood to have called for a vessel 600 feet long. The boats will have 600 cabins with accommodations for about 2,000 passengers each and were designed by Frank E. Kirby, naval architect at Cleveland and New York.

Two and a Half Million Dollar Contract for Four Diesel Electric Dredges Awarded to Sun Company

AT a price of $2,528,240, the Sun Shipbuilding Company, Chester, Pa., has been awarded the contract for the construction of four Diesel-electric, seagoing hopper dredges for the War Department, Washington, D. C. The Sun Company submitted the lowest tender out of a list of 16 bidders, including four navy yards.

The ships are to have an overall length of 268 feet 5 inches, each, length between perpendiculars 254 feet, beam molded 46 feet, depth 22 feet 6 inches, draft loaded 19 feet 6 inches and speed 11½ knots.

According to the specifications, each vessel will be equipped with three engines of the McIntosh Seymour type of 1,000 brake horsepower on the four-cycle system.

Steamer Caldas Awarded to Federal Yard for Overhaul

THE steamship *Caldas* of the Grace Line was awarded on September 13 to the Federal shipyard at Kearney, N. J., for general reconditioning of hull and engines including the alteration of bulkheads for fuel oil and miscellaneous repairs. The contract will cost about $35,000.

City of Norfolk to Spend $650,000 for Harbor Property

THE city of Norfolk, Va., will on October 1, 1922, make an extensive addition to its holdings of waterfront terminal property. The City Council has authorized the purchase of wharf, pier and warehouse property of the Old Dominion Steamship Company on Water street for $650,000. The purchase was recommended to the Council by City Manager Charles E. Ashburner, the property having a frontage of 650 feet on the water front.

Under the plan recommended by the city manager, the city is to issue $650,000 worth of 4½ percent fifty-year bonds.

Acceptance Trials of Submarine S-48 Prove Successful

UNITED STATES submarine *S-48*, built by the Lake Torpedo Boat Company, Bridgeport, Conn., successfully completed her official Government acceptance trials on Saturday, September 9. The trials were conducted under the supervision of a trial board consisting of Capt. J. G. Tawresy, Lieut. E. F. Zemke, Lieut. J. D. Jones, Lieut. Whitney and Messrs. Ford and Moore recorders.

The earlier trials consisted of surface and submerged firing of service torpedoes, one hour full speed submerged run, steering gear tests ahead and astern, quick reversing of engines, fuel economy tests, operating at various depths submerged and changing depths without change of trim, quick submergence from full power submerged under motors to a depth of 40 feet in 64 seconds. After the completion of these tests, a 52-hour endurance run was made, four hours of which was at full speed, 14½ knots, and the remainder of the time at 13¾ knots. This latter trial, considered the most severe test required to be carried out, was accomplished without a failure of any description. The engines, which are of the Busch-Sulzer type, and auxiliaries functioning perfectly.

The design and construction of this vessel has been stated frequently by naval officials to reflect great credit upon the builders and the boat is considered to be in advance of any submarine now in this or any other navy.

Charles Ward Engineering Works Awarded Contract for Construction of Sternwheel Lighthouse Tender

THE contract for the construction of the steel, stern wheel, steam-propelled lighthouse tender *Greenbrier* for the Lighthouse Service of the Department of Commerce, Washington, D. C., has been awarded to the Charles Ward Engineering Works, Charleston, W. Va., at a price of $128,000. The time of completion or delivery is 12 months. The bids submitted for the work were as follows:

Charles Ward Engineering Works, Charleston, W. Va.	$128,000
Howard Shipyard and Dock Company, Jeffersonville, Indiana	128,727
Johnson Iron Works, New Orleans, La.	159,800
Dubuque Boat and Boiler Works, Dubuque, Iowa	137,000
Charles Hegewald Company, New Albany, Ind.	169,000
Dravo Contracting Company, Pittsburgh, Pa.	169,800

The vessel will be for use in the upper Mississippi and Ohio rivers and will have a length overall of 164 feet 6 inches; length, molded, 140 feet; beam over guards, molded, 32 feet 6 inches; depth at side, molded, 5 feet; draft, light steaming condition, 2 feet 8 inches. The tender will have a complete steel hull braced by longitudinal and transverse bulkheads. The propelling machinery will consist of twin non-condensing steam engines direct connected to a radial stern wheel and supplied with steam by three horizontal underfired flue boilers. The vessel will be equipped with a hand steering gear and also a steam steering gear of the direct acting single cylinder type similar to the Crowley-Johnson or other approved make and sufficient capacity to operate the boat's three rudders.

An approved cast steel double barreled capstan, driven by a double cylinder steam engine in the forepeak, will also be supplied and there will be two metallic lifeboats about 15 feet long, fitted with air tanks, certified for 11 persons each, provided with solid round bar swinging davits; and a life raft of the catamaran type certified for not less than 8 persons. The boat will be heated throughout by steam.

The main engines will have cylinders 15 inches in diameter with a common stroke of 84 inches and all parts designed for a working pressure of 200 pounds.

Boilers

There will be 3 steam boilers of the Mississippi river type designed for a working pressure of 200 pounds per square inch. Each boiler will be about 26 feet long having two lap welded flues without joints.

The generating set will be mounted on a common sub-base of cast iron and be of a steam turbine direct driven type having a capacity of 10 kilowatts making approximately 3,600 revolutions per minute.

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Orders for Three Additional Lake Freighters Expected

IT is reported on good authority that contracts will soon be placed on the Great Lakes for three additional freight steamships. Although definite details are not available at this time, the vessels will probably be about 600 feet long and have a deadweight carrying capacity of approximately 12,000 tons. The total cost of the three vessels will probably be close to $2,500,000 and it is expected that the orders will be placed before the end of this month.

Supply Vessel for Commercial Pacific Cable Co. to Be Built by Sun Shipbuilding Company

THE supply ship for the Commercial Pacific Cable Company which has been designed by Cox & Stevens, naval architects, 25 Broadway, New York City, has been awarded to the Sun Shipbuilding Company, Chester, Pa.

This vessel, which has a length of 169 feet 6 inches between perpendiculars, 30 feet beam and 15 feet depth, is equipped with triple expansion engines having cylinder diameters of 17 inches, 25 inches and 42 inches with a 30-inch stroke. Steam is to be generated in two Scotch boilers fitted with Dahl oil burners.

The cost of the vessel could not be learned but it is understood that it was close to $1,000,000. The contract calls for the completion of the ship in March, 1923.

Bids October 10 On Diesel Electric Tug for Mobile

BIDS for the construction of a 100-foot Diesel electric towboat for the United States Engineer Office, Mobile, Ala., will be received at Mobile until 11 A. M. October 10, 1922, according to latest announcements. The proposed vessel will have a length overall of 119 feet 3⅝ inches; length, molded, 100 feet; breadth, molded, 23 feet; depth, 5 feet; draft, loaded, 3 feet. The vessel and equipment will be built to the American Bureau of Shipping rules.

The vessel will be heated throughout by a hot water heating system and an Ideal-Arcola heater or equal of suitable size fitted for burning oil, if practicable, otherwise for coal, will be installed in the generator room. A motor-driven capstan will be installed, the capstan having a 9-inch barrel and will be about 32 inches high capable of pulling 6,000 pounds at 15 feet per minute. The motor will be of the inclosed ventilated type of at least 5 horsepower.

MACHINERY

The two Diesel engines will be a standard commercial product of American manufacture. At least two of the engines of the size offered shall have been under successful operation for at least one year on the date of opening bids and shall be under successful operation on that date, the bidders to furnish name of motors, location of engines, purpose for which used and length of time in actual operation.

MAIN GENERATING SETS

There shall be installed two multiple cylinder two- or 4-stroke cycle fuel Diesel engines, each capable of developing sufficient power to produce an output of at least 100 kilowatts. Each engine will be direct connected to an open type, direct current, continuous rating generator with a capacity of at least 90 kilowatts and with a 10 kilowatt exciter direct connected on main shaft.

OTHER EQUIPMENT

The main generators shall be shunt wound separate excited open type and of at least 90 kilowatts capacity at 125 volts D. C. The exciters shall be compound wound open type of at least 10 kilowatts capacity at 125 volts D. C.

The propelling motor shall be shunt wound separately excited open type and be at least 200 horsepower at 240 volts, 600 revolutions per minute.

A 7½ kilowatt 125-volt direct current generator direct connected to a gasolene engine on the same bedplate will be installed in the engine room. The engine shall be a four-stroke cycle 4 or 6 cylinder type with forced lubrication, cylinders and oil cooler water cooled, magneto ignition and complete with all necessary equipment.

Duluth Shipyard Is Awarded Contract for the Construction of Government Derrick Scow

THE Marine Iron & Shipbuilding Company, of Duluth, Minn., which submitted the lowest bid to the United States Engineer office at Duluth for the construction and delivery of a steel derrick scow, complete with machinery and equipment, has been awarded this contract. The scow is to have an over all length of 147 feet 4 inches, a beam molded of 40 feet and a capacity of 715 long tons.

The Marine Iron & Shipbuilding Company submitted bids on two propositions, as follows: (A) to construct the derrick scow complete, as specified, and to make provisional delivery afloat at the builders' yard—$97,844.22; and (B) to construct the derrick scow from contractor's own designs, weights and specifications, complete with steel hull, derrick, houses, living quarters, and stock machinery and equipment, in acordance with Government plans and specifications—$93,220.22.

Twenty-Six Additional Contracts Placed By Newport News Yard for Reconditioning Steamship Leviathan

TWENTY-SIX additional contracts for material to be used in the reconditioning of the steamship *Leviathan*, the world's greatest ship conversion job, have been placed by the Newport News Shipbuilding & Dry Dock Company, Newport News, Va., according to latest official announcement. A wide variety of material is covered in the new contracts. The list of supplies and the manufacturer are as follows:

MATERIAL	MANUFACTURER
Door Switches for Wardrobes	Woodhouse Electric Co.
Wire for Floor Outlets	Hazzard Mfg. Co.
Asbestos Millboard for Radiators	Ehret Magnesia Co.
Radiator Valves for Heating System	McNab & Harlin Mfg. Co.
Slate Panel for Switchboard No. 2	Portland Monson Slate Co.
Vises for Carpenters and Plumber Shops	Southern Supply Company
Manila Rope for Running Rigging	Columbian Rope Co.
Carbon Brushes	Morganite Brush Co.
Brass Gasket Rings for Ozone Gen. Tubes	W. L. Woodside Co.
Plastic Fire Brick	Jointless Firebrick Co.
Fire Screen Bulkhead at Frame No. 155	Coburn Trolley Track Mfg. Co.
Injectors for Donkey Boiler	Hayden & Derby Mfg. Co.
Pax-Tite Leather Packing for Telemotor Pistons	Watson Stillman Co.
Armature Coils for Ventilation Fan Motor No. 173	Standard Electrical Mfg. Co.
Flexible Metallic Steam Hose	The American Metal Hose Co.
Recording Electric Pyrometers	The Bristol Company
Olomel Tester Putty	Olomel Mfg. Co.
Lacquer Screens for 1st class Social Hall	Robt. W. Chanler
Indicating Thermometers for F. O. Tanks	Schaefer & Budenberg Mfg. Co.
Sight Flow Indicators for Lubricating Oil System	S. F. Bowser & Co.
Leather Packing for Change Valves	The Watson Stillman Co.
Receptacles for Outside Deck Fixtures	Oceanic Electrical Supply Co.
Steam Traps for Sanitary System	Strong Carlisle & Hamond Co.
Copper Smith Work on Copper Coil Radiators	R. A. Burroughs & Co.
Thermometers for Forced Lubrication	Schaefer & Budenberg Mfg. Co.

P. & R. Railroad May Build New Docks in Cape May Harbor, N. J.

Following the start of the work of deepening the entrance to Cold Spring inlet, which leads into Cape May harbor, N. J., by the dredge *Abscom*, announcement is made that the Philadelphia and Reading railroad intends to build docks on the north side of the harbor.

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Conversion of Four Steamers Awarded Todd Shipyards

THE contract for the conversion of four ships of the Southern Pacific Steamship Company from coal to oil burning vessels has been awarded to the Todd Shipyards Corporation, at a total cost said to be $336,800. The ships involved are the *El Siglo* and *El Cid*, which went to the Robins Yard, Brooklyn, N. Y., and the *El Dia* and *El Rio*, which have been placed at the Tietjen & Lang plant, Hoboken, N. J.

The bids submitted for the conversion and work incidental thereto are understood to have been as follows:

Tietjen & Lang	**$336,800**
W. & A. Fletcher	**348,000**
Robins D. D. & R. Co.	**360,800**
Morse D. D. & R. Co.	**400,000**

Shipbuilding In America Shows a Favorable Advance

There were under construction in American shipyards on September 1 a total of 25 seagoing steamers of 156,530 gross tons and 75 steel river and harbor boats of 37,395 gross tons, according to figures compiled by the American Bureau of Shipping. This shows an increase of 9 ships and 40,000 gross tons over July 1.

Since September 1, contracts for eight new ships are known to have been placed in American yards.

The work in progress on new steel tonnage on September 1 is shown in the following table:

All-Steel Vessels

Yard	No.	Gross.
American Shipbuilding Co.	4	33,100
Bethlehem Shipbuilding Co.—		
Sparrow's Point	3	15,900
Alameda Plant	3	28,500
Federal Shipbuilding Co.	3	16,000
Great Lakes Engineering Works	1	6,585
Manitowoc Shipbuilding Co.	1	4,900
Newport News Shipbuilding Co.	3	11,125
New York Shipbuilding Corp.	2	13,600
Pusey & Jones	2	5,240
Sun Shipbuilding Co.	2	13,004
Toledo Shipbuilding Co.	1	8,400
Total	25	156,530

River and Harbor Boats

River and harbor steel tonnage building and contracted for in the United States for private owners September 1:

Yard	No.	Gross.
American Bridge Co.	18	4,900
American Car & Foundry	3	1,500
Bethlehem Shipbuilding Corp.—		
Baltimore D. D.	3	2,100
Alameda Plant	2	2,400
Consolidated Shipbuilding Corp.	2	500
Doullut & Williams	1	450
Dravo Contracting Co.	15	4,930
Eichlacy, John, Jr.	1	65
Federal Shipbuilding Co.	3	2,850
Johnson Iron Works	1	250
Kyle & Purdy	1	300
Los Angeles Shipbuilding and Dry-dock Co.	2	2,400
Marietta Manufacturing Co.	1	250
Midland Barge Co.	4	2,500
Pusey & Jones	1	300
Riter-Conley Manufacturing Co.	5	2,150
Staten Island Shipbuilding Co.	4	5,150
Tebo Yacht Basin	3	450
Ward Eng., Charles	2	2,000
William Cramp & Sons	3	2,100
Total	75	37,395

Midland Barge Company Has Low Bid of $59,850 for Two 4,000-Barrel Steel Oil Barges

THE bid of $59,850, for the construction and delivery of two 4,000-barrel steel oil barges for the Mississippi River, submitted by the Midland Barge Company, of Midland, Pa., has been recommended for approval by the U. S. Engineer Office, at New Orleans, La.

Tenders were submitted on September 15 with the following results:

Midland Barge Company	$59,850
Charles Ward Engineering Works	71,750
Penn Bridge Company	74,250
Dravo Contracting Company	79,550
Nashville Bridge Company	86,940
Tampa Shipbuilding and Engineering Company	96,000
Johnson Iron Works Dry Dock & Shipbuilding Company	85,275
American Bridge Company	104,500

The barges will have a length molded of 120 feet, beam molded 36 feet, depth molded 7 feet 6 inches.

Charles Ward Engineering Works Is Low Bidder for Construction of Two Steel Barges for Alabama

THE Charles Ward Engineering Works, of Charleston, West Virginia, with a price of $17,000, submitted the lowest tender for the construction of two steel barges for the United States District Engineer Office, at Florence, Ala., for which bids were opened on September 18. The proposals, which have been submitted to the Chief of Engineers at Washington for approval and award, were as follows:

Charles Ward Engineering Works	$17,000
Midland Barge Company	17,800
Nashville Bridge Company	19,240
Penn Bridge Company	19,340
Dravo Contracting Company	20,870
American Bridge Company	21,750
Howard Shipyards & Dock Company	22,773
Virginia Bridge & Iron Company	23,895
Charles Hegewald Company	24,490
Johnson Iron Works Dry Dock & Shipbuilding Company	26,900

Jahncke Dry Dock Company of New Orleans Busy with Newest Reconditioning Contract Awards

THE Jahncke Dry Dock Company, of New Orleans, La., has been awarded the contract to recondition the U. S. Engineer Department dredge *Galveston*. The work includes the general overhauling of all machinery and will cost about $50,000.

The Jahncke Company has also been awarded the contract to paint forty of the Mississippi Warrior steel barges, type C-500, this work to be done while the barges are making their usual trips up and down the Mississippi River. The company has converted a wooden barge of their own into a houseboat for store rooms and living quarters for the men on the above work. The contract involves about $75,000. The yard will also drydock the Sinclair Navigation Company's tanker *Tamesi* for a general overhauling.

$24,870 Bid By Nashville Bridge Co. for Dredge Pipe

BIDS for thirty 40-foot lengths of 20-inch discharge pipe, one 90 degree 20-inch elbow and four 3-foot lengths of 20-inch pipe for United States hydraulic pipe line dredge *Wahalak*, were opened by U. S. Engineer Office, at Mobile, Ala., on September 5. The Nashville Bridge Company, of Nashville, Tenn., with a figure of $24,870, submitted the lowest total price.

Sun Yard to Build Three Barges for Pennsylvania R. R.

IN addition to the contract announced recently, which was awarded by the Pennsylvania Railroad Company to Pusey & Jones Shipbuilding Company, Wilmington, Del., for the construction of a steel floating grain elevator, 100 feet long, a contract has been awarded by the same company to the Sun Shipbuilding Company, Chester, Pa., for the construction of three barges, each with a capacity of between 40,000 to 50,000 bushels.

The floating grain elevator will be capable of delivering from 12,000 to 15,000 bushels an hour and will be equipped with special machinery built by the Webster Manufacturing Company, of Chicago, Ill.

Million Dollar Port Improvement for Pearl Harbor

THE Bureau of Yards and Docks, Navy Department, Washington, D. C., has received bids under specification 4501 for clay walls and pier at the naval operating base, Pearl Harbor, H. T., as follows:

For the work complete, from the Hawaiian Dredging Company, 854 Kaumana street, Honolulu, (1) $1,000,000 (450 days); (5a) add $23,000, deduct $21,000; (7) add $5, deduct $3; (8) add $1.50, deduct $1.00; (10) 90 cents telegraphic modification; (1) deduct $188,257; (5) deduct $4,715 add $6,396.

J. Lloyd, McKansas Building, Honolulu, (1) $1,105,736 (450 days); (2) $1,200,860 (450 days); (3) $785,000.

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Marine Construction News of the Month

Ship Contracts — New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPS AND SHIPBUILDING

Additional Contract, Savannah, Ga.—Coast Guard cutter Yamacraw also went to Wilkinson Company's shops to undergo repairs.

Steam Pump Repaired, Buffalo, N. Y.—Steamer City of Buffalo was at Buffalo drydock to have one of her steam pumps repaired.

Lighter Repairs, Savannah, Ga.—A government derrick lighter went on Wilkinson marine railway to undergo repairs to the hull.

Schooner Drydocked, Portland, Ore.—The schooner Dauntless was lifted on the Port of Portland drydock for cleaning and painting the hull.

Dredge Drydocked, Chester, Pa.—The War Department's dredge Delaware was drydocked at the Sun Shipyard for miscellaneous repairs and painting.

Steamer Inspection, Long Island, N. Y.—Steamer Medon went to Hunter's Point drydock to be inspected by representatives of the Alaska Steamship Company.

Freighter to Be Repaired, San Francisco, Cal.—The Mary Hanlon went to San Francisco for repairs to her bow, stove in as a result of a collision with an oil tanker.

Conversion to Oil Burner, San Francisco, Cal.—A. R. Wood Lumber Company secured the Lake Bridge from the Shipping Board and re-converted her to burn oil.

Steamer at Southern Yard.—Steamer Cockaponset, assigned to Lykes Brothers for the London and Hull berth, moved from Nine Mile Point to be drydocked for repairs.

Italian Steamer Drydocked, Chester, Pa.—The Italian steamer Tet; was towed to the Sun Shipbuilding yards, where she was placed in drydock for miscellaneous repairs.

Boilers, Etc., Installed, San Francisco, Cal.—Steam schooner Brunswick went to the Eureka Boiler Works to have a new thirty-foot smoke stack and donkey boiler installed.

Propeller Blade for Steamer, Maryland.—The British Steamship North Pacific was docked at Sparrows Point for replacement of a broken propeller blade and to have her hull painted.

Conversion to Oil Burning System, Savannah, Ga.—United States dredges Morgan, Savannah and Gilmer went to Wilkinson Dry Dock Company to be converted to the White oil burning system.

Schooner Overhauled, Seaford, Del.—The Cumberland Queen, one of the largest four-masted schooners ever seen on the Nanticoke River, went on the ways at Seaford for complete overhauling.

Repairs to U. S. S. Eagle 34, San Francisco, Cal.—The U. S. S. Eagle 34 was towed into San Francisco bay with a broken planetary reduction gear. The vessel was taken to Mare Island for repairs.

West Coast Repairs.—At the Potero Plant of the Bethlehem Shipbuilding Corporation the company drydocked the Japanese freighter Ginyo Maru for temporary repairs. Price $25,000; time 12 days.

Baltimore Plant Contracts, Baltimore, Md.—The Baltimore Drydocks Plant of the Bethlehem Shipbuilding Corporation has received contracts for overhauling the Robin Hood and repairing the Nelson.

Vessel Repairs, San Francisco. The South Coast went to San Francisco to be repaired, her mast and cargo booms missing and pilot house stove in as result of accident while unloading at Los Angeles.

New Ferry Ordered, Detroit, Mich. Great Lakes Engineering Works were awarded contract to build a ferry steamer for the Detroit-Walkerville route. She will have a capacity for forty-five automobiles and 2,000 passengers.

Contract Award, Jeffersonville, Ind.—The Howard Shipyards is reported as having received a contract to construct a packet boat for the Eagle Packet Company, of St. Louis. The vessel will be 225 feet long and 50 feet wide.

Repairs, West Coast.—Steamer San Pedro, steam schooner Washington and lumber carrier Wahkeena went to the Bethlehem yards to be drydocked for cleaning. The dreadnaughts Oklahoma and Pennsylvania went to Hunter's Point.

Construction of Diesel-Electric Dredges, Chester, Pa.—Sun Shipbuilding Company was awarded the contract for the construction of four Diesel-electric, seagoing hopper dredges for the War Department, Washington, D. C. Price $2,528,240.

Contract Awarded, Cleveland, O.—The contract for the construction of two passenger steamers to cost a total of $6,000,000 was awarded to American Shipbuilding Corporation of Cleveland, O., by the Cleveland and Buffalo Transit Company.

Cleaning and Painting Contracts, California.—Southern Pacific ferryboat Santa Clara went on drydock to undergo cleaning and painting, and the Union Oil Company's carrier Oleum went on the Moore ways to also be cleaned and painted.

Sun Yard to Build Barges, Chester, Pa.—A contract was awarded to the Sun Shipbuilding Company by the Pennsylvania Railroad Company for the construction of three barges, each with a capacity of between 40,000 to 50,000 bushels.

Tug Completed, Milford, Del.—The Vineyard Shipbuilding Company completed a 60-foot wooden tug for the Munson Line, to be used in Cuban waters. The vessel will be propelled by a 100-horsepower Fairbanks-Morse surface ignition oil engine.

Bethlehem Plant Awarded Contract, Cal.—Bethlehem Shipbuilding Corporation, Union Plant, was awarded contract to install feed water heater, new feed pumps and new evaporators on the United States army transport President Grant. Price $22,000.

Contract for Freighter, Staten Island, N. Y.—The contract for the new steel freighter for the Catskill Evening Line was awarded to the Staten Island Shipbuilding Company. Price $101,260. Contract covered construction of hull, machinery foundations only.

Bethlehem Yard to Build Float, Baltimore, Md.—The sparrows Point Plant of the Bethlehem Shipbuilding Corporation was awarded contract for the construction of a car float for the Baltimore & Ohio Railroad, 283 feet long, 37 feet beam, and 10 feet 6 inches depth.

Canadian Commander Repairs.—The steamship Canadian Commander, which recently ran ashore at Plate Point, Little Miquelon, is at the Canadian Tankers' yard, Montreal, undergoing repairs which will cost close to $100,000. The ship sustained considerable hull damage.

Repairs, Pittsburgh, Pa. Landing boat of Second Pool Coal Company, Allegheny River, was placed on ways of the Pittsburgh Dock Company for general overhauling. Two barges of the Equitable Towing and Transportation Company also went on the ways to be repaired.

Installation of Watertube Boilers, New York.—The New England Steamship Company, New York, placed an order with Babcock & Wilcox Company, 85 Liberty street, New York, for eight marine watertube boilers, aggregating 9,000-horsepower, for installation on Fall River liner Priscilla.

Special Type Ship Ordered, London, England.—The firm of Workman, Clark and Company, Ltd., is reported as having secured an order for the construction of a coal carrier of 10,000 deadweight tons of special type for an American firm. The new ship will be about 425 feet in length.

Steamboats Repairing, Great Lakes Section.—Steamer Samuel Mitchell went to Ecorse yards to have her engine rebuilt. Steamer Douglas Houghton was placed in drydock at Lorain for repairs to her wheel and rudder, and steamer Robert Fulton went to Cleveland for minor repairs, as a result of a collision.

Tanker Alameda Reconditioned, Philadelphia, Pa.—The former United States Navy tanker Alameda, which was beached near Cape Fear last winter, is said to have been purchased by the William Cramp Ship and Engine Building Company, which is planning to recondition her and offer her at a competitive sale.

Repair Work, Mobile, Ala.—Alabama Dry Dock & Shipbuilding Company made following repairs to steamship Federal: removed entire turbine, gears, etc., and replaced same; installed new lubricating system; made and installed with necessary piping to accommodate the oil system, and changed from forced feed to sight gravity system.

Construction of Motor Passenger Launch, Stamford, Conn.—The Luders Marine Company was awarded a contract for constructing fast motor passenger launch, 40 feet long, 9 feet beam, 5 feet 6 inches depth, and 3 feet draft, by the Standard Oil Company of New Jersey for the account of the Standard Oil Company of Venezuela.

Shipyard Activities, Mobile, Ala.—Mexican tug El Aguila went to plant of the Alabama Dry Dock and Shipbuilding Company for repairs. Considerable work was done on tug's plates, tailshaft, etc. Other vessels repaired at the same yard included the barges Coastwise, Oriole and Choctaw, the tug Hukey and the Coast Guard cutter Arrow.

Sub-Chasers Converted, New York.—Seabury & de Zafra, Inc., naval architects, 150 Nassau street, were awarded following contracts: Completion of engine trials of sub-chaser; prepare plans for conversion of another for yacht service, and a third for commercial use of fur interests; fit out E. S. Pawnee for wrecking and lighterage operations along Atlantic Coast.

Ferryboat for San Francisco, Cal.—Aven J. Hanford, president and general manager of the Golden Gate Ferry Company, has announced that a second steamer to engage in the service now maintained by the ferryboat Golden Gate between San Francisco and Sausalito is under construction. The vessel is to be named the Golden West and will be of the same type as the Golden Gate.

Installation of Boilers, Pittsburgh, Pa.—The Pearson Manufacturing Company received the contract to install a battery of three boilers on steamer National of the J. K. Davison & Brothers. They will be of the two-flue type, 38 inches wide and 26 feet long. The company also completed repairs to the boilers and machinery of the steamer Hibernia, owned by the Equitable Towing and Transportation Company.

Construction of Two Passenger Steamers, Wilmington, Del.—Contract for construction of two day-passenger steamers, driven by reciprocating engines, at total cost of $529,000, was awarded by the Wilson Line, of Wilmington and Philadelphia, to the Pusey and Jones Company of Wilmington, Del. Vessels designed by George G. Sharp Company, naval architects and consulting engineers, 30 Church street, New York City.

Repairs to Six Ships of San Francisco Corporation.—Six ships of the Pacific Freighters' Corporation were awarded to the following companies: Pequot Casco and Arcadia, Robins Dry Dock & Repair Company, Brooklyn, N. Y.; the Pawnee, Sun Shipbuilding Company, Chester, Pa.; the Isonomia and Ida, Maryland Dry Docks, Baltimore, Md. Repairs included drydocking, scraping, painting, boiler work and general overhauling subject to inspection.

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Spanish Naval Orders.—According to accounts from London, a contract has been arranged between the Spanish government and the Sociedad Espanola de Construccion Naval covering a period of three and a half years and providing for the construction of two large and powerful cruisers, together with destroyers, gunboats and submarines. It was stated that the cruisers will be of the Raleigh type, heavily armored, with powerful guns and that the armament will be supplied by Messrs. Vickers, Limited, and the armor plates by Messrs. William Beardmore and Company, Ltd.

SHIPYARDS AND DRY DOCKS

Establish Wood Yard, New Orleans, La.—A shipyard, for building and repairing small wooden boats, is to be established on the Jefferson Terrace Subdivision above the Jefferson Race Track by Paul and Fred Zibilich.

Shipyards to Be Moved, West Coast.—Al Larsen's Boatbuilding Plant, the Wilmington Boat Works and the M. and M. Machine Shop will be forced to move from Mormon Island, near Los Angeles, Cal., because of contemplated improvements by the city of Los Angeles.

10,000-Ton Drydock Reaches Mobile.—The last of four sections of the 10,000-ton drydock being moved to Mobile from New York by the Todd Shipyards Corporation has arrived at its destination. The 1,700-mile journey was made in sixty-eight days, in spite of unfavorable weather and adverse winds. All four sections arrived in perfect condition and will be reassembled immediately for operation late this month.

Navy Yard to Close, Charleston, S. C.—November 1 will mark the date of the closing of the Charleston Navy Yard. It had been expected that the yard would be closed about September 1, orders having been issued that it should be closed as soon as possible, but owing to the unemployment at Charleston, Acting Secretary Roosevelt decided to defer the closing and provide for the gradual discharge of the employees.

New Section Added to Drydock, New Orleans, La.—A new 5,000-ton section is being added to the present 2,000-ton drydock of the Johnson Iron Works Dry Docks and Shipbuilding Company. This will increase the efficiency of the plant and at the same time enable it to accommodate the largest vessels that enter the port of New Orleans. The section, constructed in New York, represents an outlay of $100,000, and was towed to New Orleans from the building point. Nearly 500,000 feet of lumber were used in the construction of the section. The new dock will accommodate vessels drawing 21 feet of water and will be operated by electricity. About twenty vessels a month are handled by the concern.

PORT IMPROVEMENTS

Pier Extension, San Francisco, Calif.—State Board of Harbor Commissioners, Calif., awarded contract to Clinton Construction Company for extending Pier 22. Price $76,365.

Pier Contract, Philadelphia, Pa.—Simpson, Brown & Company, 90 West street, New York, were awarded contract by F. H. Caven, Director of Public Works, Philadelphia, for one story pier building, Allegheny Avenue and Delaware River and also for improving and enlarging Allegheny Wharf 127. Engineer's estimate, $100,000.

Pier Extension, San Francisco, Cal.—The Clinton Construction Company was awarded the contract for extending Pier 44 to meet the requirements of the China Mail Steamship Company, to whom that section of the waterfront docking space had been awarded, by the State Board of Harbor Commissioners. The Clinton Company, with a price of $57,425, was the lowest bidder of five, the highest being Hannah Brothers, who asked $62,350 for the work.

Contract Let, Orange, Tex.—Contract for construction of additional units to the municipal wharves was awarded by wharf and dock commission to Houston Construction Company. Improvements are to cost approximately $221,000. Contract provides for the extension of the wharf apron for a distance of 1,008 feet; construction of two roofed sheds, dimensions of each being 400 by 90 feet; the extension of the municipal railway tracks behind the new warehouses for a distance of about 1,000 feet and construction of 100 feet of open platform between the two houses. A brick fire wall will separate the two sheds. Contract provides that work shall begin at once and shall be completed within 150 days from date of beginning. Wharf and dock construction contract will be carried out under a bond issue for $250,000, suspended for 1921 and put into effect in 1922.

GOVERNMENT WORK

Riprapping Dike, Mare Island, Cal.—Specification 4,700. Bureau of Yards and Docks, Navy Department, Washington, D. C., plans riprapping dike.

Riprap Protection, Hampton Roads, Va.—Specification 4,699. Bureau of Yards and Docks, Navy Department, Washington, D. C., plans riprap protection for north breakwater at Hampton Roads.

Steel Hull, Montgomery, Ala.—Johnson Iron Works Dry Dock & Shipbuilding Corporation, Morgan and Seguin streets, has received a contract from U. S. Engineer, Montgomery, for a steel hull for dipper dredge Upatoi. Price $25,850.

FOREIGN ACTIVITIES

Larache Harbor Developments, Morocco.—A sum of 3,461,000 pesetas for Larache Harbor Works is included in a supplementary credit of about sixty million pesetas for public works in the Spanish zone of Morocco, laid before the Spanish Parliament by the Minister of Finance.

Floating Dock, Trieste.—A floating dock of reinforced concrete construction, 64.15 metres long and 21 metres wide, has been recently acquired by the Navigation Company of Trieste. The dock has electrically driven centrifugal pumps installed and has a lifting capacity of 2,000 tons. It has been built for the repair of vessels on the Adriatic fleet of the company.

Launching of Steamer, Scotland.—The steamer Spero was launched by the Dundee Shipping Company. The company built the vessel for Ellerman Wilson Line of Hull. The dimensions of the Spero are as follows: Length, 257 feet; breadth, 37 feet; and depth moided, 19 feet. The new ship, which will be engaged in the produce trade between Denmark and Great Britain, will be fitted with refrigerating machinery.

Trials of Passenger and Mail Steamer, Scotland.—The Scott's Shipbuilding and Engineering Company, Greenock, completed and handed over the twin-screw passenger and mail steamer Aconcagua, built for the Compania Sud Americana de Vapores, of Valparaiso. The vessel is one of two sister ships, the second to be launched later. The Aconcagua ran trials on the Firth of Clyde and attained a mean speed of 17½ knots—half a knot over that stipulated in the contract, all machinery working with great smoothness. The two vessels are each 438 feet in length over all, 56 feet molded breadth, 33 feet depth molded to bulkhead deck, of 7,000 tons gross, and of 8,500 shaft horsepower.

Maiden Voyage of Canadian Pacific Steamer.—The new steamship Montclare, the third new "M" steamship of the Canadian Pacific Line, completed her maiden voyage to Montreal successfully. She was launched on December 17, 1921, at the yards of John Brown & Company, at Clydebank, Scotland. The Montclare, built to the requirements of the highest class of Lloyd's Register under special survey, is classed "100A1," and is a geared-turbine steel steamship with two funnels. The vessel is 566 feet long, 70 feet in breadth, 51 feet depth; over 16,418 tons, with regular speed of 17 knots. Accommodation is provided for not less than 620 cabin passengers, and 1,550 third class passengers. She burns oil for fuel.

Oil Tank Steamer Launched, Newcastle-on-Tyne.—Swan, Hunter & Wigham Richardson, Ltd., from their Neptune Shipyard, launched a large oil tank steamer, being built to the order of the British Tanker Company, Ltd. The steamer, which is designed to carry over 10,000 tons of oil, is about 455 feet in length by 57 feet beam, and is being constructed to attain the highest class in Lloyd's Register. The propelling machinery will consist of a set of turbines of the Metropolitan-Vickers Rateau type, with double reduction gearing of the three-box, floating frame type, steam being supplied by three large boilers fitted with Howden's system of forced draft, and burning oil fuel on the Wallsend-Howden system. The principal engine-room auxiliaries will be electrically driven. The vessel was named the British Gunner.

Oil Tanker Launched, Scotland.—Messrs. William Beardmore & Company, Ltd., launched from the East Yard of their Naval Construction Works, Dalmuir, the oil tanker British Merchant, to the order of the British Tanker Company, Ltd. The vessel is built of steel under special survey to class 100A1 at Lloyd's and is framed throughout on the Transverse System. She has a length between perpendiculars of 440 feet, breadth 57 feet, depth molded 33 feet 11 inches, 26 feet 6 inches draft, and is of 10,000 tons deadweight with a speed of 11½ knots. Her oil carrying capacity is about 9,500 tons of light oil in twenty compartments carried up to the main deck, with expansion trunks to the upper deck and side tanks between the main and upper decks. Steering gear is electrically driven, all other auxiliary machinery being steam-driven. Propelling machinery consists of one set of compound turbines of Metropolitan-Vickers type driving double-reduction gearing, and steam is supplied by three single-ended cylindrical boilers.

Chilean Ports to Be Improved.—A German engineering firm has been awarded a contract for erecting a modern pier, etc., at Valparaiso. All material for the pier, which will be constructed of cement and steel, are also to be obtained from Germany. The contract calls for an irregular triangle extending into the sea, its base formed by the shore line, and its sides by two massive stone walls, which, starting at the base, will converge in the waters of the harbor. This triangle will cover an area of 17,280 square metres, while the wall will have a length of 199 metres on the west side and 135 metres on the north side of the triangle. Extending toward the west, in continuation of the north sea-wall, the pier proper will be constructed of re-inforced concrete. The length will be 162 metres, and the width eighteen metres at the starting point, diminishing to 16.8 metres at the extreme end. Loading and unloading equipment is not included in the contract, the placing of this contract being in the hands of the Railway Department, Santiago-de-Chile, which has now complete control of the Arica-La Paz Railway. The equipment will consist of one 25-ton, two 3-ton and two 5-ton electric cranes, and two special chutes for loading ore into lighters will be required. The construction price of the pier and attendant works is 3,050,000 pesos (paper), plus 200,000 pesos (gold), of 18d. The work is expected to occupy at least two years. Besides improvements at Valparaiso, complementary works at the port of Antofagasta and repair works at the ports of Constitucion, Iquique, Talcahuano, Lebu, Puerto, Saavedra and Valdivia will be carried out.

Danzig's Shipyards Internationalized.—Danzig's shipyards and railway shops, in the past operated by the City Government, are to be "internationalized." The Danziger Werft (Danzig Shipbuilding Yards) and the railway shops are employing about 5,000 men at the present time on repair work largely, but the building of five steamers for Chile has begun. The repair shops were the property of the German Government before Danzig became a free city. The committee appointed some months ago by the Senate of the Free City of Danzig to formulate plans for operation of these properties has just submitted its report to the Senate. The adoption of the plan recommended by the committee is not absolutely certain, although as about eight months have been spent in perfecting the project it seems highly probable that the scheme will be carried through. According to the plan, both the shipyards and the railway shops are to be "internationalized," each being converted into a stock company conducted independently of the other, although having community of interest. The capital of each company is to be 20,000,000 German paper marks; the stock to be taken by four groups—the first, the French company, Societe des Betignolles of Paris; the second, the English company, Cravens & Company, Ltd., of Sheffield; the third, a group of eight Warsaw banks, and the fourth, not yet formed, a group of Danzig banks and capitalists. Danzig and Polish interests are each to have 20 per cent of the capital stock in each of the companies; in the shipyards company the English group is to have 60 per cent, and the French company is to have 60 per cent of the railway shops' stock. The title to the property, grounds, buildings and equipment is to rest in common with Danzig and Poland.

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Todd Yard Holds Successful Tests of New Equipment on Fireboat

The official tests of the New York City fireboat *James Duane*, held at the Clinton plant of the Todd Shipyards Corporation, proved highly successful and indicated that she will be the most efficient fire fighter afloat. New turbines and pumps were inspected at the plant by the Fire Commissioner, Thomas Drennan, and other officials from the Fire Department and the National Board of Underwriters.

The new pumps are Lea-Courtney centrifugal, single stage double suction, driven by Westinghouse steam turbines. Against a pressure of 150 pounds, the pumps discharged 9,800 gallons of water per minute; against a pressure of 175 pounds, the pumps delivered 7,900 gallons per minute; against a pressure of 300 pounds, the pumps delivered 4,850 gallons of water per minute.

STEAMSHIP INTERESTS

The Rutland Railroad, which disposed of its lake steamers when the provisions of the Panama Canal law went into effect, has announced a resumption of rail and lake freight transportation between New England and the West via Ogdensburg, N. Y.

Blakely Smith & Company, of Houston, Texas, local agent for the Nervion Line, has announced the extension of its service to include direct sailings from Houston to Genoa, Italy. The Houston-Barcelona service of the line will be maintained as usual. The first ship of the new service is due in Houston about October 1. Sailings at monthly intervals will be maintained. Although all cargo offered will be accepted, it is thought that a large portion of the shipments will consist of cotton. Large shipments of cotton are expected to move through Houston to Genoa this season.

Saturday, August 19, was the second anniversary of the first sailing of the United American Line from New York. Since August 18, 1920, the United American Lines has had a total of 436 sailings of American flag ships from United States North American ports.

The steamer *Santa Ana* will be added to the fleet of the Grace Line operating between New York and ports of the West Coast. Sailings from September 7 will be fortnightly instead of every three weeks as heretofore. The combination cargo and passenger vessels now operated in the service by the Grace Lines are the *Santa Louisa*, *Santa Elisa* and the *Santa Teresa*. Each has accommodations for about 100 passengers. Ports of call in Chile and Peru are Callao, Mollendo, Arica, Iquique, Antafagasta, Valparaiso and Tulcuano.

According to announcement by Walker-Ross, Inc., the Tatsuuma Kisen Kaisha has inaugurated a transpacific service between the Pacific Northwest and the Orient. The first steamship in this service is the *Somedono Maru*, which will go on berth in Puget Sound during the last half of September, loading for Japanese ports. A monthly service will be maintained from Puget Sound and British Columbia ports, and also from Columbia River and Grays Harbor if inducements are sufficient.

The Danish East Asiatic Company is to re-establish offices in Seattle and will in the future maintain regular service out of that port for the first time since the beginning of the World War in 1914.

TRADE PUBLICATIONS

GALVANIZING EQUIPMENT.—Apparatus of the moving cathode type for galvanizing and plating has been developed by the U. S. Galvanizing and Plating Equipment Company, 32 Stockton street, Brooklyn, N. Y. The arrangement of the apparatus, its value in a variety of plating work, together with numerous illustrations and diagrams, make up the pamphlet. Contained in the same covers is also a pamphlet on U. S. automatic cleaning, pickling, acid dip, neutralizing, rinsing, drying and allied equipment.

STOKERS.—Bulletin 294 has been issued by the B. F. Sturtevant Company of Boston, Mass., describing the Sturtevant underfeed stokers, which include a centrally located horizontal retort, extending longitudinally with the furnace and provided at its upper edge with tuyeres through which air is introduced to the fuel as it rises into the fire. A complete explanation of the operation is given with illustrations.

HEAVY DUTY DIESEL ENGINES.—Atlas Imperial mechanical injection fuel Diesel engines are described in a catalogue issued by the Atlas Imperial Engine Company, Inc., Oakland, Cal. An explanation of the mechanical problems met in Diesel engine design with illustrations and characteristic details of engines in small and large power units are given together with numerous views showing application of these engines in stationary and marine practice.

CAST IRON STORAGE TANK.—The Conveyors Corporation of America, Chicago, has issued a new booklet describing its American cast-iron sectional storage tank which is designed for holding loose, bulky, dry materials for storage or transfer. The booklet is illustrated with engravings showing the tanks in use at a number of well-known plants. Diagrams give details of construction and a comprehensive table of weights and measures is included.

WELDING REPAIRS.—Methods of utilizing welding in repair work in England are outlined in a bulletin recently sent out by Barimar, Ltd., Oxford street, London, England. Details for engine and general machine repairs are explained with photographs of the work in process and in the finished state.

SEAMLESS STEEL TUBES.—The third of a series of four bulletins describing the manufacturing processes carried on by the Standard Seamless Tube Company, Pittsburgh, Pa., has recently been sent out. The subject dealt with in this case is the cold draw department.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers
Navy Department, Washington, D. C.
Secretary-Treasurer—S. M. Robinson.
U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers
29 West 39th Street, New York.
Secretary and Treasurer—Daniel H. Cox.

National Asociation of Engine and Boat Manufacturers
29 West 39th Street, New York City.
Secretary—R. R. A. Hand.

United States Naval Institute
Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association
15 Park Row, New York
President—E. A. Simmons.
Secretary—Robert B. Lea.

Marine Engineers' Supply Men's Association
Room 507, 30 Church Street, New York.
Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots
National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

American Society of Marine Designers
Secretary—B. G. Barnes, 47 Saville Avenue, Quincy, Mass

National Marine Engineers' Beneficial Association
Headquarters 311-315 Machinists Building, Washington, D. C.
Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association
1701 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

American Steamship Owners' Association
11 Broadway, New York
President—H. H. Raymond.
Vice-President and General Manager—Winthrop L. Marvin.

United States Ship Operators' Association
149 Broadway, New York
President—C. H. Potter

National Merchant Marine Association
Munsey Bldg., Washington, D. C.
President—Hon. J. E. Ransdell.

The Maritime Association of the Port of New York
78 Broad St., New York City
President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association
Detroit, Mich.
Secretary—George A. Marr.

Neptune Association
21 Pearl St., New York City
Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers
15 Whitehall St., New York City
Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada
Grand Secretary-Treasurer—Neil J. Morrison, Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects
5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland
39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders
Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

Institute of Marine Engineers, Incorporated
The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Naval e Meccanici in Italia

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